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RUBBER AGE

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SCIENTIFIC MANAGEMENT FOR RUBBER MANUFACTURERS

The Application of Burden—XIV.

By Alfred Baruch

Consulting Industrial Engineer, New York

THERE is a tendency among rubber manufacturers to make the price at all times represent the cost of production. This would be an excellent thing if prices were at all times the same. But even before the war it was an established fact that prices were more unstable in the United States than in any other country in the world. The theory is that prices cover the cost of production. But prices here were never steady enough to warrant a practical application of this theory. They were either quite high or quite low due to the current market.

Consequently, general business conditions are such that it is impossible to earn for every month all the expenses incurred during that month. Most manufacturers try to meet the situation by adding the unearned expense to the price of the following month, and in that making it more difficult to sell rubber goods. A man may find that he has earned $100,000. for a month and that his cost for that same month has been $110,000. It is natural for him to try to add the unearned $10,000. to the price the next month so as to try to make it up. The step is unwise from the business point and impossible from that of the scientific manager. A distinction must be made between the earned and the unearned burden or else there will be no check on the efficiency of the factory.

In normal times, if the burden is unusually high, the factory is badly managed. Money is being wasted on unnecessary expenditures. When business is dull and the burden is high a part of the rise at least is due to poor management. It is obvious that it is impossible to make the distinction between low earnings and poor management unless the actual burden is separated from the current cost of production. When it is separated an index to factory efficiency is obtained.

The Burden of Poor Management

To illustrate this point we will assume that the normal burden for the calender department of a rubber factory doing about $1,000,000. is 50c per productive labor hour. In one factory of this type, however, the burden runs 75c per productive labor hour for a given period of low production. If this figure of 75c is permitted to stand unchallenged no indication will be obtained of the department's efficiency. If, however, it is found from past records that production has dropped about 30% and has therefore caused an increase in the burden rate of 15c, it is easy to see that poor management causes the burden to be at least 10c higher than it should. It is thus established that the actual indirect expense should not be charged to the cost of running a department if that department is not working to capacity, because this practice distorts the costs so as to make them seem high when production is low and low when production is high. For example, assuming that the departmental burden is set at $2000. but that the actual burden for one month runs $2500, the department has failed to earn its burden by $500. This $500. cannot be added to the price since only as much burden may be charged as there has been actual production for it.

The best way to meet the situation is to establish a normal rate of burden based on as many years' experience as the factory has at its command. Suppose the records of one department for the past five years has run about as follows:

$1.00 per productive labor hour the first year.
$0.90 the second year.
$0.85 the third vear.
$0.80 the fourth year.
$0.75 the fifth year.

This makes an average of $0.86 per hour which constitutes the normal burden for this department. The next year is one of low production and the overhead mounts to $1.00 per productive hour again. This one dollar is added to the other six and then the total is divided by six which gives an average figure of 88c. This figure now becomes the hourly burden for this department. If 88c represents the normal burden then he would charge at this at all times no matter what the condition of business was. Suppose, for example, that his labor costs for the month were $4000., representing 4000 hours. At 88c per hour his burden earnings for the month are $3520. But the actual burden for the month is $4000 which leaves a deficit of $480. This $480. should not be added to the budget estimate for the next month but should be carried to a suspense account as burden loss. Assuming that business improves and the factory works 5000 hours the next month, he will earn $4400. for burden. This is an excess of $400., the actual burden for the month being $4000. Therefore he can carry the $400. to the burden account as a profit. This offsets the loss of the preceding month in part.

Of course it is perfectly obvious that every lean month will not be immediately followed by a fat one which counterbalances it. But over any given period of time, such as a year or more, this will be true. By this method the charges against the shop are reduced when business is low and they are automatically increased when business is good. A careful consideration of this method and intelligent application of it will prove that it is the only satisfactory way in which this problem of unearned burden can be met.

The Proper Way to Apply Burden

There are many existing methods for applying burden. The important thing is to decide which one is best suited for a rubber factory. These methods are listed below in the order in which they will be taken up:

1. *Percentage-of-material-cost.* This method assumes that as material rises or falls in price, the factory expenses will also rise and fall.
2. *The blanket-rate method.* This burden is calculated as percentage of the cost of labor and material. This method is sometimes varied by lumping the burden with the profit and charging the total as percentage of the cost of labor and material.
3. *Direct-labor-cost-method.* Burden in this case is figured as a percentage of the productive labor wages.
4. *Direct-labor-hour-method.* This is similar to the labor cost method except that the burden becomes a flat charge per productive hour instead of a percentage of the wages.
5. *Machine-hour-rate* or *production-center method.* This method makes a flat charge for every hour that an order takes to pass through a given point as a machine or a work-bench.

Percentage on material and the blanket rate method are similar in that they both assume that the burden will rise and fall according to the changes in the cost of material and labor. As a matter of fact burden is nearly always constant while labor and material fluctuate continuously.

This is especially true of the crude rubber market. If the percentage of burden is determined on the basis of the price as it exists today and a week later the price has dropped, the return for burden will not be sufficient unless the rate is changed every time there is a change in the price of rubber or fabric. This is well-nigh impossible.

An even more serious objection to this method is that it will make a distinction between classes of work. For example, the production of inner tubes which have a high material value in proportion to labor cost would be over-burdened as compared to tire casings which have a high labor cost in proportion to the value of the material. This gives any competitor who knows his costs an immense advantage since he can leave the unprofitable products to his competitor and corner the market in the profitable ones. The uninformed competitor is forced by the blanket rate method to sell one product high and the next one low.

Strangely enough, it is the fear of this very competition that leads many manufacturers to use the blanket method. They operate on the principle that it is necessary to meet competition regardless of cost and that accurate cost records are unnecessary since such burden as one can earn can be figured by the blanket rate method as well as by any other.

The Direct Labor Method

Burden is applied to labor only in this case. The cost of handling material is taken care of by direct charges. There are two ways of applyng burden to direct labor. One is to direct labor cost and the other is to direct labor time. The chief objection to the direct labor cost method is that it penalizes the particular lot of tires, tubes, or other products going through if it happens to go through the hands of highly paid men rather than through those of cheaper labor. In the preparation departments the machines go on whether they are operated by cheap or expensive labor. It is obviously unfair to charge one lot more than another because the labor cost happened to be higher at the time.

On the other hand, the direct labor hour method penalizes the lot that is produced by slow men instead of the fast ones. This is especially true in those departments where the operations are largely manual, as in the tire-building room for example. Here the speed of the man determines the burden that each item carries as it passes through this point. This too is unfair since there is no reason why one lot should cost more than another simply because one set of men work faster than another.

Both of these methods fail to meet actual conditions in the departments where power machines are used exclusively. In the tire-building department, under this method, a tire made by hand would cost a lot more than a tire made by machine since both would be charged at the same rate—that is, per hour or per dollar of direct labor—and the machine-made tire would be produced much more quickly and therefore much more cheaply. In the preparation departments, where there are large power machines such as calenders or bias-cutters, it is absolutely impossible to apportion the burden on the basis of either the wages or the time of labor since several men work on one machine and the machine itself is power-driven, so that it does not matter whether men are fast or slow.

The Rate Per Production Center

It has already been established that whenever material must be changed from a raw into a finished state the length of time required to bring about this conversion is the measure of the expense incurred. Where the operations are entirely manual cost of labor or the time of labor is necessarily the basis for distributing the burden. But where a machine is used other elements than the cost of material, labor, and general burden enter into the cost.

In order to meet this condition each machine or work-bench is designated as a production center and for all practical purposes becomes a department or a little shop in itself. This production center is charged with all the expenses incurred by it, such as indirect labor, supplies, maintenance, repairs, the rent for the floor space it occupies, its proportion of the heat, light, power, taxes, insurance, depreciation, and any other charge that cannot be distributed directly.

When the machine is idle it is naturally failing to meet its expenses. The best way to handle the cost of the machine while it is idle has been the occasion for much controversy among experts. A. H. Church has tried to solve it by adding on a supplementary rate which varies according to the earnings of the previous month or, if so desired, of the previous year. However, the principle of the normal rate can be used here just as well as in the case of the department.

The burden rate per production center hour is desirable from many points of view. The production center is stationary and every order that passes through is charged only the expenses that are incurred in the time it takes it to go through. This makes each order pay for itself and also assures each lot of production with being charged the full amount of its burden expense. Take a calender, as an illustration. It may be used for sheeting out tube stocks, sidewall, and other gum stocks. The basis for burden application here is the pound or yard of rubber. Since sidewall and tube stock cannot be run through in the same time each of these will take a different rate. We will say that a calender can produce ten rolls of gum stock per hour and that each roll is 50 yards long. The burden on this production center is $1. per hour. Therefore the burden rate per yard of tube stock is ½c. If the sidewall averages 1000 yards per hour, the rate is 1/10c per yard. This rate can be applied on the basis of pounds or any other convenient unit. A different rate is established for each kind of product that goes through the production center and all that is necessary in calculating the costs is to add the unit rate to the prime costs.

This method establishes accurate unit cost automatically as may be seen at once. It offers a budget by means of the actual burden earned which can be compared to the standard rate monthly or oftener. Once it is established it is easy to apply and it saves a great deal of clerical work.

Charging administrative and selling expense into the cost is quite a different matter than charging burden. Here the expense does not vary in direct proportion to the time spent upon each unit of production. The time spent on an order that does not finally come through is just as expensive as the time taken in actually closing an order. However, there is a direct relation between the money spent in getting orders and the volume of orders secured. Therefore it is justifiable to charge selling and administrative expense as flat percentage of the total cost of production since the production will vary with the sales.

Interest on Investment

The question of interest on the plant investment has been the occasion for much debate. The question is whether interest is a part of the cost or not. This discussion has nothing to do with the position of tax experts and theoretical economists on the inclusion of interest. A rubber manufacturer must know his cost in order to price his products. This cost has certain definite components and we must know whether interest on the plant investment is one of them.

The difficulty lies in the confusion of interest with profit.

(Continued on Page 288)

U. S. Bureau of Standards Tire Tests

Separation of Tread from Casing the Cause of Failure in Most of the Tests to Date

DR. S. W. STRATTON, former director of the United States Bureau of Standards, Washington, D. C., and recently elected president of the Massachusetts Institute of Technology, Boston, has furnished THE RUBBER AGE with the results of tests of various tires run off on the bureau's endurance tire testing machine a photograph of which is reproduced in connection with this article.

ENDURANCE TIRE TESTING MACHINE AT THE U. S. BUREAU OF STANDARDS

Aside from a periodic inspection of each tire, it is kept running until some general failure develops throughout the casing. The machine is not designed to test the treads and very little tread wear is shown. Failure usually results from ply or tread separation, the latter being the cause of failure in most of the tests run up to this time.

The figures supplied by Dr. Stratton are rather surprising in view of the generally higher mileages obtained from fabric and cord tires in actual service. For example, three 32 by 4 cords ran an average of 4000 miles and five 32 by 4 cords of different makes gave an average of 2500 miles. Certain cords of standard make on city streets and country roads have been known to run as much as 15,000 to 20,000 miles without tread or ply separation and without failure other than wearing down, and the average has been fully 100 per cent higher than the bureau's figures. Some heavy truck cords have been known to give 30,000 to 40,000 miles without failure, and recently a truck cord of British make produced a record mileage of 67,000 and was reported as still in the running.

Average Mileage of Tire Tests Low

The bureau's report on these tests follows:

"30 x 3½ fabric and cord tires have been run with an axle load of 600 pounds and an air pressure of 50 pounds. Ten 30 x 3½ fabric tires of different makes gave mileages ranging from 1000 to 6000 with an average of 2700 miles. Three cords ran from 3500 to 4500 with an average of 4000. 32 x 4 cord tires have been run with an axle load of 1000 pounds and an air pressure of 60 pounds. Five 32 x 4 cords of different makes ran from 1000 to 4500 miles with an average of 2500 miles."

The tires are mounted, free to revolve, on movable carriages and pressed against the drums with the desired loads by means of weights acting through bell crank levers as shown in the illustration. The drums, each of which is operated through a clutch, are driven at a surface speed of thirty miles per hour, giving the tires a flexing and rolling action similar to that to which they are subjected in actual service. Each drum has six cleats across its face so that the tire is subjected to bumps in addition to the deformations due to rolling. There is a speedometer on each drum which indicates the distance traveled. The relative performance of tires is measured by the miles traveled before failure develops.

In connection with these tests on the endurance machine the properties of different tires are being studied by means of dynamometer tests and an effort is being made to coordinate the results obtained.

By means of these tests it is hoped to establish a more satisfactory basis for government purchases of tires; also that data of value to the tire manufacturer and user may be obtained.

Market for Tennis Shoes in South Africa

By U. S. Consul M. B. Davis, Port Elizabeth

WHILE there are but 25,000 white persons in Port Elizabeth and 1,500,000 in the whole Union of South Africa, the market for certain styles of tennis shoes is very good, as tennis is a popular year-round game. The statistics available do not show tennis shoes separately and, consequently, it is impossible to quote exact import figures. However, the United Kingdom furnishes the greater part, while the United States is a very poor second.

A more expensive tennis shoe is worn here than is customary in the United States. The usual style is a shoe having an upper of white buck or high-grade canvas, with a sole of either thick rubber or chrome, retailing at from 40s. to 60s., which at the present rate of exchange would amount to from $9 to $13.50 per pair. Cheaper grades of canvas shoes of the same general style are obtainable at from 20s. to 25s., which would amount to about $4.50 to $5.75 per pair. Still cheaper ones, something on the style of the cheapest grade of tennis shoes utilized in the United States, can be secured from 8s. 6d. to 12s. 6d., or about $2 to $2.75 per pair. It would seem that a shoe with a good quality rubber sole and heel should meet with a good sale here, especially if advertised and sold at a price between 15s. and 20s.

The chief difficulty in introducing an article of this kind would be to place it on the market at a lower price than that asked for competitive makes. The merchants in this district allow themselves a very large margin of profit which they claim is necessary because of their small turnover and high overhead expenses. Retailers are inclined to sell at a high price, which keeps down the volume of business. There is every reason to believe that a proper retail price coupled with a certain amount of advertising would materially improve business in this particular line. The import duties on boots and shoes amount to 20 per cent ad valorem, with a minimum per pair of 9d. for men's, 6d. for women's, and 3d. for children's sizes. A rebate of 3 per cent ad valorem is allowed on all goods from the United Kingdom and reciprocating British possessions.

An Improved Method of Controlling the Boll Weevil

George D. Smith, Associate Entomologist of the Florida State Plant Board, Evolves Plan Which Insures Ninety Per Cent of Normal Cotton Crop

IT is no exaggeration to say that the boll weevil has cost the cotton planters of the south hundreds of millions of dollars' loss in actual money and other huge losses which may be considered irreparable. Agents of the United States Department of Agriculture estimated the boll weevil damage in 1921 at $610,000,000. The losses to the textile industry and other industries like tire manufacturing which are more or less dependent upon cotton growing cannot be calculated, but if they could be the figures would be staggering. It was even reported a few years ago that a million dollars would be paid to anyone who discovered and perfected a method for eradicating these costly pests that have spread over the southland like swarms of locusts, devouring almost every cotton boll in sight.

Now the welcome hand of hope is held out to the cotton planter by the improved method of controlling the boll weevil described in Bulletin 165 of the University of Florida Agricultural Experiment Station, published in October 1922. It describes the plan and the results obtained by George D. Smith, associate entomologist of the Florida State Plant Board, formerly with the Bureau of Entomology, United States Department of Agriculture, from experiments conducted by him this year in three Florida counties. Wilmon Newell, director of the station, in his introduction to the bulletin declares that Mr. Smith's experiments "have given most gratifying results; so gratifying and encouraging, in fact, that it is felt that a new era is at hand for the Florida cotton grower." Mr. Newell adds this warning note, however, in addenda pasted on the front of the booklet:

"Farmers in other states should not attempt to make use of the control method unless the date of completion of spring emergence of the weevil is definitely known. This information should be secured from your own state entomologist or experiment station whose advice should be sought before attempting the use of this method of boll weevil control."

"The Biggest Step Toward Repression of the Pest"

The dirctor of the Florida experiment station says that Mr. Smith's control method "is the biggest step toward complete repression of the pest that has ever been made." He adds the following significant statement:

"Those who have followed closely and critically the experimental work during 1922 and have visited and examined the treated cotton fields from time to time have come inevitably to the conviction that the relatively simple control method which has been evolved through Mr. Smith's work now makes it possible for the Florida grower of upland cotton to insure for himself at least ninety per cent of a normal crop, so far as weevil damage is concerned.

"It has been evident, on poor soils and good, in fields with fertilizer and those without, that the treated fields produced practically as much cotton as if there had been no boll weevils; while untreated fields and check areas—usually only a few hundred feet from the treated fields—produced insufficient cotton to pay for seed and cultivation.'"

Mr. Smith thus describes his own experiments leading up to the plan adopted this year and the improved method of control which has proved so successful:

Experiments Along a New Line

It has long been known that the boll weevil can be quite effectively poisoned during the period preceding the appearance of the first squares. However, the last of the overwintering weevils do not emerge from their hibernating quarters until several days after the cotton plants normally begin square formation. A suitable application of lead or calcium arsenate, made just before the squares appear, kills practically all weevils in the field. But the weevils emerging later on deposit their eggs in the early squares, thus starting the season's infestation. After squares develop, the adult weevil is difficult to poison and the poison, of course, has no effect on the eggs and larvae, which are within the squares.

After several years of investigation it occurred to us that the first weevil generation of the season might be largely disposed of by removing or "stripping" from the cotton plants the first squares of the season, and with them the eggs deposited by the over-wintered weevils.

During 1919-21, while stationed at Madison, Florida, and engaged in investigations for the Bureau of Entomology, United States Department of Agriculture, the writer made experiments in stripping squares from the cotton plants early in the season, and while this disposed of the first infested squares, it was observed that there always remained a considerable number of weevils.

These experiments were encouraging in that the extra amount of cotton produced on the stripped plots indicated that one stripping, although it did not clear the field of weevils, was slightly beneficial and that two strippings, about ten days apart, would insure a marked increase in the quantity of cotton produced. On the other hand, two strippings might delay the fruiting of the plants to a dangerous degree. However, the condition in which the cotton

PERMANENT COTTON STATES COMMISSION TO SOLVE BOLL WEEVIL PROBLEM

ESTABLISHING of non-planting zones as a means of controlling the boll weevil and the pink boll worm was suggested at the Cotton States Commission conference which opened in Memphis, Tenn., Dec. 4.

Permanent organization of the commission with power to investigate cotton conditions and make recommendations to the State legislatures was offered by W. W. McLean, Governor elect of North Carolina and former chairman of the War Finance Board. Mr. McLean outlined the conference plans and policies in an address before the afternoon session.

"Federal and state appropriations must be increased to handle cotton problems for southern farmers," he said. "All the states must act as a unit with the federal government if the boll weevil is to be eliminated and cotton warehoused and marketed properly. Non-cotton planting zones should be established and machinery, legislative and otherwise, set up for the purpose of giving just compensation to planters in such zones.

"The cotton insect problem is one of national concern which can be solved only through combined resourses of the state and federal government and the planters, merchants, and business men of the nation."

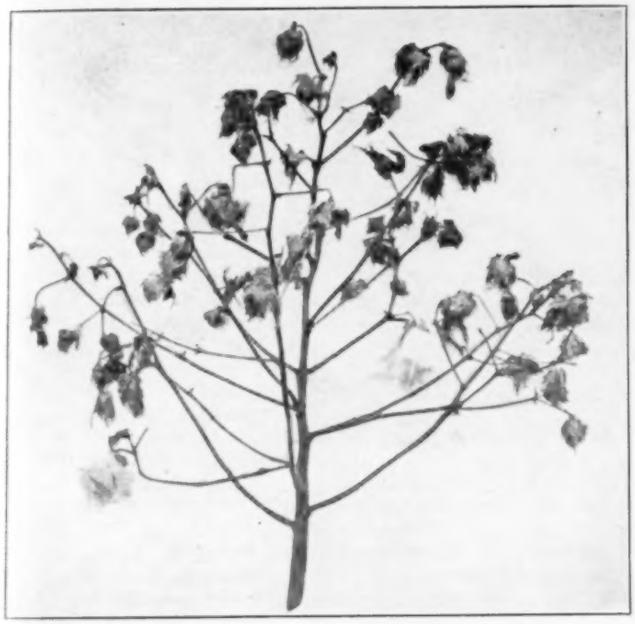
The boll weevil damage in 1921 was around $610,000,000, agents of the U. S. Department of Agriculture told the conference. The conference favored the passage of state laws governing the growing of cotton in the infested areas.

"The time has arrived when the South must work as one unit if the great cotton industry is to continue," said Chester Morrill, assistant secretary of agriculture.

Bills to be presented to the legislatures of cotton states on control of the boll weevil and a uniform system of warehousing and marketing will be drafted by the commission.

plant is left after removal of the squares is the very condition under which poison can be applied with most telling effect. Deprived of squares in which to hide and on which to feed, the weevil must necessarily turn to the terminal or growing bud of the plant for food. It is very easy to literally fill this terminal bud with a suitable poison by means of a good dust gun.

At this time, also, the over-wintered weevils have only a few more days to live and their instinct to survive urges them to feed liberally. The application of poison to the terminal



COTTON PLANT, WITH LEAVES REMOVED, SHOWING EXTENT OF FRUITING 22 DAYS AFTER REMOVAL OF ALL SQUARES (ORIGINAL)

buds at this stage has been followed, in all our experiments, by the destruction of practically every weevil that escaped capture in the stripping operation.

If the stripping is done about June 5 to 8, the number of weevils still remaining in winter quarters and which can still come to the cotton fields is of practically no consequence. These few stragglers cannot increase sufficiently to seriously affect the number of bolls set on the plants in the two months following.

Because such treatment of a cotton field may appear to the reader somewhat radical and because an understanding of the principles involved is quite necessary to a clear interpretation of the experiments described on subsequent pages, we are giving, first, a description of the methods used and the factors involved and, second, a detailed account of the experiments in which these principles have been applied.

The Improved Method of Control

The method of control which the writer has evolved is simple. In substance, it consists in clearing the cotton field, early in June, of all the adult weevils and, at the same time, of destroying their eggs and larvae; thus leaving the cotton plants free to develop squares and bolls without weevil interference for the succeeding seven or eight weeks.

Having disposed of the over-wintered weevils and their progeny, no additional weevils of any consequence will come to the field before the annual migration, which usually takes place about August 1. Upland (short staple) cotton bolls, which are more than half grown when the summer migration occurs, succeed in maturing and opening, because the first migratory weevils arriving in the fields late in July turn to the squares and do not attack the green bolls to any great extent.

In this respect the treated field, on arrival of the first migratory weevils, is in a condition comparable to that of any ordinary cotton field earlier in the season. That is, while the weevils are destroying the squares the bolls largely escape their attack.

In considering these facts it should be remembered that before the boll weevil appeared in Florida the cotton crop was normally made by the middle of August. On the Florida sandy soils the cotton plant shows a very determinate habit of growth; that is, it reaches practical maturity in the latter part of summer and does not normally make an appreciable amount of cotton after that time. Cleaning the cotton fields of weevils early in June, therefore, affords the cotton plant almost as long a period in which to set fruit as it enjoyed in a normal season prior to the advent of the weevil.

This fact undoubtedly explains why, in the majority of our experiments, yields have been secured practically as great as those upon the same farms before the boll weevil came.

The Experiments of 1922

As a result of the experimental work mentioned in the preceding pages the idea was conceived of combining square-stripping and poisoning as a means of controlling the weevil and increasing the yield of cotton. In order to test this theory under farm conditions, plans were made and carried out for making observations on relatively large scale field-tests during 1922.

These experiments were located near the towns of Madison, Live Oak, Wellborn, Gainesville and Hawthorne. Both upland and sea-island cotton were included in the tests. Only the results with upland cotton are discussed in this bulletin, as the acreage of treated sea-island was too small to permit of reliable conclusions.

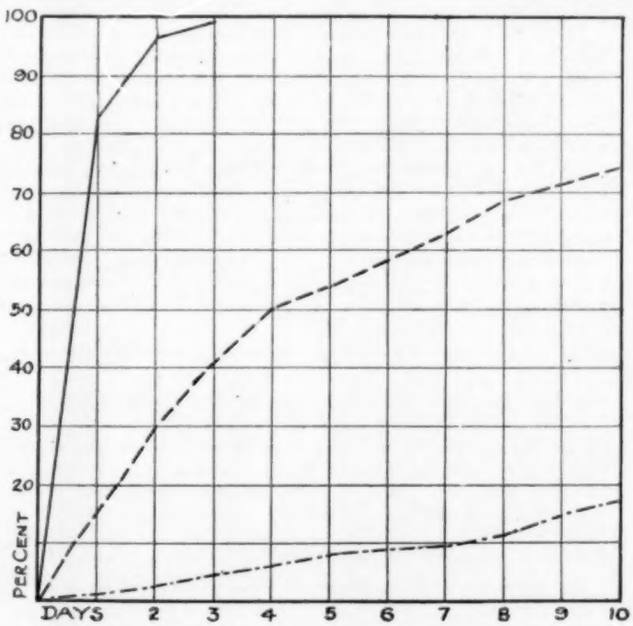


CHART SHOWING WEEVIL MORTALITY UNDER CERTAIN CONDITIONS: (A) ALL SQUARES REMOVED, FOLLOWED BY APPLICATION OF POISON (HEAVY LINE); (B) POISONING WITHOUT REMOVAL OF SQUARES (DOTTED LINE); (C) WITHOUT EITHER SQUARES REMOVED OR POISONING (BROKEN LINE)

All of the tests were located in fields where conditions were apparently very favorable for the boll weevil.

Briefly stated, the object of these experiments was to determine whether removal of the first squares, followed immediately by one application of poison, would dispose of practically all weevils in the field and, if so, whether weevil damage thereafter could reach the point where production of cotton would be seriously interfered with.

It may be stated at this point that the removal of all squares on or after June 5, followed by one thorough application of lead arsenate or calcium arsenate at the rate of from five to seven pounds to the acre, resulted in not more than an average of one weevil to the acre being left in the fields. Even if

this weevil should happen to be a female and commence depositing eggs immediately, the first generation of her offspring would not reach maturity and deposit eggs before about July 5. The number of squares punctured by this generation would hardly offset the natural shedding of the plants. The second generation could not mature before about August 5 and while it is granted that this generation might consist of many weevils, it must be remembered that the Florida crop of short staple is, by this date "made" and sufficiently matured that practically no damage from the weevil can take place.

Manner of Making Field Tests

In testing any method of control, it is essential that the field conditions be as nearly typical as possible. It is only by such field experiments that profit or loss, resulting from the control operations, can be determined.

In the experiments herein described, certain fields were treated to control the weevil while others were left untreated for comparison. Not all fields were treated on the same date, however. The fields, both treated and nontreated, were selected so that surrounding weevil-hibernating quarters, drainage and soil conditions would be as nearly alike as possible.

Measurements were made of all fields and plots. In Madison and Suwanee Counties these surveys were made by Chas. S. Wadsworth, of Madison. The cotton picked from each field was kept separate and carefully weighed and recorded. Arrangements were made with the owners to plant the fields on the same dates as far as possible, and to cultivate them in the same manner throughout the season.

Manner of Applying the Poison

The machine used in our experiments was a hand duster of a well-known make, which forces the poison through the nozzle with a current of air. On account of its being operated by hand the nozzle can be manipulated in such a manner as to force some of the poison into the terminal bud of each plant.

Other methods of applying the poison, such as dusting from sacks and distributing "broadcast," were tried but none gave satisfactory results. On account of the boll weevil's habit of feeding in the terminal buds when there are no squares present, any machine used for applying the poison must in some manner force the poison into these feeding places.

Infestation Records

The percentage of punctured squares in a cotton field offers reliable data for determining the extent of infestation by the weevil. If only a small percentage of the squares are punctured during June and July, a good crop, all other things being equal may be expected. On the contrary, a heavy infestation during early summer is always followed by a greatly reduced yield.

Removing or stripping the squares from the plants early in June results in the absence of all squares for a few days and of punctured squares for a considerable period. However within five to seven days after stripping, new squares take the place of those removed. In the method of control used in these experiments, stripping is followed by poisoning. Any weevils not destroyed by this dual treatment proceed to attack these new squares. The percentage of infestation following the treatment shows its effectiveness as well as the rate of increase of any weevils that have not been destroyed.

For convenience, the records of infestation used in this bulletin were based upon an examination of 200 squares in each of three representative places in each field at intervals of 15 days. All squares on a plant were examined and counted and when 200 squares had been inspected the number of weevil-punctured ones was recorded. This count was repeated until a total of 600 squares had been examined in each plot.

The first examinations were deferred until July 1 in order that any weevils missed by the control operation might have time to establish an infestation that could be quite readily found.

How "Profit" or "Loss" Is Determined

Any successful method of controlling the weevil must not only increase the yield but must also result in sufficient increase to more than offset the cost of using it. The cost of removing the squares from the plants, of the labor for applying the poison and of the poison itself must be deducted from the value of the increased production to determine accurately what has been accomplished by using the control method.

In the experiments described herein the value of labor by women and children in removing squares is estimated at the prevailing local rate of $.60 a day of ten hours or $.06 an hour, while the adult male labor used in applying the poison is estimated at $1 a day or $.10 an hour. The wages paid for ordinary farm labor vary in different sections of the state and this will, of course, cause a corresponding variation in the profit secured by controlling the weevil in this way.

The cost of calcium arsenate is calculated at $.10 a pound. This is about the maximum retail price for this material in Florida during 1922.

Although we have not included the cost of using dust guns in estimating the cost of weevil control in the experiments herein described, this item must be considered. A good hand duster for applying the poison is absolutely essential. A good one can be bought for about $10 and with proper care and handling will last several seasons. Under average conditions the annual acre cost for dust-gun investment and depreciation should not exceed $.25.

BOLL WEEVIL REDUCES GEORGIA YIELD 1,000,000 BALES, CAUSING PLANTERS $150,000,000 LOSSES

THE vital importance of concentrating on the control of the boll weevil was pointed out by Dr. R. J. H. Deloach, director of Armour's Bureau of Agricultural Research and Economics, at the cotton conference in Augusta, Ga., on Dec. 12.

"Within the past three years," said Dr. Deloach, "the yield of cotton in Georgia has decreased from 1,800,000 bales to 750,000 bales. In terms of the present prices it means a loss of $150,000,000, a loss that can never be recovered in any way. All of the states east of the Mississippi have sustained losses in almost the same proportion.

"The condition of this state has become so serious I am told in the past twelve months about 40,000 farms or farm titles have changed hands. The destruction of such a large volume of wealth has never been known before in the history of agriculture. All this is traceable directly to a little pest, not as large as a housefly, known as the Mexican boll weevil.

"To control the weevil simply means:

"1. Kill the weevil in winter as far as possible by destroying the old stalks, plowing them under, cleaning the hedges and getting all stumps out of the cotton field.

"2. Begin using the poison in early spring as soon as there are signs of the appearance of the weevil on young plants. Continue this until the squares disappear and, if time permits, pick the first squares as recommended by the Florida Experiment Station; then put on a good coat of dust.

"3. Pick up all squares in the early season and in this way destroy the young grubs and eggs, and dust again when the weevils appear the second time.

"4. Use enough fertilizer and the right kind to make cotton and to pay for extra cost to fight the boll weevil.

"5. Cultivate a little oftener and more thoroughly and there is no doubt that a fair crop will follow as a result."

Frank H. Barrett, president of Barrett & Co., of Augusta, Ga., the largest cotton factors in the world, stated that the government's method of dust poisoning is not as efficient as the "hill molasses" method. The poison contains calcium arsenate with other ingredients which are held together with the molasses. The "molasses mixture" attracts the weevil and is as useful in dry as wet weather.

EDITORS NOTE: As we go to press we learn that the American Cotton Growers Association has announced that a fund of $2,500,000 would be expended in effort to combat the boll weevil, which their figures show is greatest present menace to American agriculture: "Unless the weevil is conquered by science," one official of Association stated, "cotton growing is doomed in America.

Some Mill-Room Observations

Helpful Hints of a Practical Nature that Will Contribute to Efficiency, Economy, and Quality

By B. W. Elberson

IN planning a mill room many things have to be taken into consideration if the utmost efficiency is to be attained. Not only the machinery and the arrangement of it for the greatest convenience in working must be studied, but also the room or building in which it is to be placed and power and water supply for it; flooring that will withstand heavy trucking and plenty of light and ventilation must not be overlooked.

A Modern Mill-Room: Mills at the Right; Calenders at the Left

It is now well understood that the larger, heavily built machines for grinding and mixing are for a number of reasons the most desirable. Large mills seldom need repairing, and of course the larger the machine the more work it will produce. Nowadays there is hardly any description of mill-room work that need be done on less than a 50 inch machine, and there are many kinds of stocks, especially tire and tube stocks, that are better and more quickly handled on 60, 72, and 84 inch mills.

For driving large mills the best and often the most economical power is steam; the heavy rolling-mill type of engine is preferable to motor drives for hard work; these latter are nearly always installed too light for the work they have to do. However, individual motors are indispensable for driving high speed calenders, as in calendering slowing down, stopping, and starting every few minutes is unavoidable. For grinding and mixing mills, that are usually set four or five or more on a line shaft and require a great deal of power, an engine of ample horsepower is better adapted for this work than motors.

The Water Supply

The water supply for a mill room should always be adequate; without sufficient cooling water the work is very much hampered and the capacity of the machines reduced. The colder the water the faster the machines can be geared to run, thus increasing their output. A roll chambered out to about all it will stand without endangering its strength will cool more quickly and stay cool longer than one cast with a small core.

Every mill room should be well provided with scales. Two of these, one near the compound room door and the other near the calenders, is about the most convenient location for them. They should be set flush with the floor so that loaded trucks can be weighed without removing the load. Air hose is also a necessity, as scales and motors should be blown out every few days to keep them in good working order. Bins for putting away mixed stocks are not as handy as piling it on platforms near the calenders. In warm weather stock is apt to settle and the sheets adhere so that it is difficult to get it out of the bins, while if piled on platforms it is easily gotten at and can be pulled apart without much trouble.

Compound Room Should Be Near Mills

The compound room should be partitioned off as near the mixing mills as possible. This minimizes trucking and is also a convenience for the man in charge who can keep an eye on the mixers and see that they are well supplied with work, and if any mistake is discovered in the batches sent out from the compound room (wrong ingredients, over or under weight) this can be quickly straightened out if the compounder is close at hand.

The newer method of batching up, adopted by some of the larger factories, is much quicker and requires less room and is cleaner than the old way, and also there is less chance of leaving out any one of the ingredients. For this method a dial scale is always used: the compound box is placed on it and balanced and each of the ingredients is weighed in the box. For instance, if the formula called for 10 pounds zinc, 3 litharge, 3 sulphur, 1 accelerator, 83 rubber, the weighing card would read

10	lbs.	zinc
13		litharge
16		sulphur
17		accelerator
100		rubber
100		Total

The weigher would put zinc in the box until the dial hand stood at 10 pounds, then add litharge until it stood at 13 pounds, sulphur to 16, accelerator to 17, rubber to 100. This one-batch-at-a-time weighing has proved more accurate than the old way of laying out a dozen or two dozen boxes and weighing (and dumping into them) each kind of ingredients as many times as there are boxes. Here there is a chance of missing a box or perhaps dumping the same ingredient twice in one box, etc.

Keep the Mills Cool

A couple of fast running 60 inch mills will grind a lot of rubber in ten hours, if well supplied with cold water. Hot machines will not grind anywhere near as fast or as thoroughly as cold ones. If the rubber is in thin slabs the breaking down can be done much faster; if kept in a warm room until needed, it will slice up quickly and a couple of men can saw a ton or more an hour without much trouble.

A good arrangement is to pile the cut rubber back of the grinders, leaving all the space in front for the trucks or wagons on which the mill man piles the rubber as fast as he grinds and flours it. A truck should be large enough to carry twenty-five or thirty rolls of about thirty-five pounds each, and if on roller bearings only one man is needed to draw it to the compound room. Batches of a size that will mix in from twelve to fifteen minutes are preferable to larger ones that take a longer time. The object is to incorporate the rubber and ingredients as quickly as possible and without

generating a heat that is liable to scorch the stock; the cooler a mixed batch is when ready to sheet out, the sooner the sheets can be put away, thus keeping the floor clear and the room more orderly.

Helpful Hints for the Mixers

Wagons for the mixers to throw their stock on as they take it off the mill in sheets are a convenience. A wagon about six feet long and three feet wide with three decks, the upper two removable, is about the right thing.

There should be a man for every two mixers whose duty it is to flour the sheets of stock and mark the formula number on each one with red or black grease crayon; he also draws the wagon to the scales, checks the weight, and piles the stock near the calender on which it is to be run. For flouring stock a mixture of one-half whiting and one-half talc is better than clear talc which leaves the sheets of stock too slippery.

Few factory superintendents realize the advantage of carrying mixed stocks right along through to the warmer and calendering them as soon after mixing as possible. Time, power, and labor are saved where this can be done.

Use Fairly Hard, Cool Mixings

Nearly fairly hard mixings will run satisfactorily shortly after leaving the mill, especially if there is scrap added to them when warming and they have cooled somewhat below the heat they are subjected to when calendering. Softer mixings usually work better if they lie a day or two to firm up, and even when cold are not very hard and break up and warm quickly without much expenditure of power or labor. These soft batches are usually for frictioning and, when mixed, if left on a cooling table made with a cold water circulation for a few minutes, will stiffen enough so that when they come to the calender they will not run too "mushy."

Many of the old fashioned ideas concerning millroom work in general are giving place to newer ones. And many of those that tend to reduce the labor cost, as much as consistent with the delivery of perfect stock into the cutting room, are being tried out.

Scientific Management for Rubber Manufacturers

(Continued from Page 282)

Profit is a residuum. It is what is left after all expenses are paid. It is the reward that society pays a man for taking the risk of engaging in business. He could avoid the risk by lending his money out on ample security, and for a smaller return. But the business man prefers to take the chance of earning a great deal or nothing. Therefore, the inclusion of interest in his cost does not mean that he will get it back in his price. But neither does inclusion of his rent in his cost mean that he will get it back in his price.

Rent and interest are very much alike. The necessity for paying rent indicates lack of sufficient capital to purchase the building that houses the plant. Yet no one would question rent as a part of the cost. Interest is a form of rent, sometimes representing borrowed money and sometimes representing the company's money. Interest must enter the price at some point and it will soon be clear why the burden is the best place for it.

Suppose a tire manufacturer wishes to substitute tire-building machines for hand-building. This will result in the elimination of a certain part of the labor cost. A substitute for this cost will be the interest on the money invested in machinery. To represent this transaction on the books as a saving in labor costs with no corresponding expenditure would be misleading and dangerous when the price is being determined. If a tire manufacturer carries a large supply of rubber on hand and he calls on an engineer to introduce measures that will enable him to operate with half the former volume, the interest thus saved is a saving in cost and the factory must be properly credited with it since it will be charged with the cost of the engineer's services. Interest in the cost is the best guide to the increase of capital turnover in the factory that is now known.

Another part of the burden that is often neglected is the depreciation charge. The greater part of fixed assets in a rubber factory waste with the passage of time. The money invested in them must be replaced or the owners will find themselves without a plant eventually. The best way to replace these wasting assets is through the establishment of a reserve fund that will grow proportionately as the deterioration progresses. There are two good methods for insuring the development of this fund. One is to make an annual charge on the basis of the percentage of value that is consumed. The other is to charge a flat rate annually for depreciation. If a machine is worth $5000. and is expected to last ten years a charge of ten per cent of the value is made each year until the original investment is replaced. That is, the first year the charge is $500.; the next year it is $450.; the third year it is $405., etc. Under the flat rate method the scrap value of the machine is deducted. We will say that is $500. This leaves $4500. to be divided over ten years. The annual charge is $450. The first method is more scientific; the second easier to apply.

India Rubber Journal (London)

A New Rubber Paving Block Test in England

The accompanying photograph shows the operation of re-laying a strip of rubber roadway in Southwark, England, with a new type of rubber paving block, developed as a result of much experimentation by Rubber Roadways, Ltd., and manufactured by the Leyland and Birmingham Rubber Co., Ltd. The blocks, which weigh 4 lb. 9 oz. each, are of the same size as the standard wood paving blocks, and are laid on the same kind of foundation with equal ease and rapidity. They are of solid rubber, but the wearing surface is, of course, of a higher quality than the base. An application of pitch to the sides of the blocks, which are grooved, and to the ends is made while they are being laid.

NEWS OF THE RUBBER CHEMISTS

Rubber Belt Dressing Composition

In United States Patent No. 1,411,912 there is described a process of making a belt dressing from a rubber composition. This composition can also be used as a friction surface dressing for brake bands, pulleys, clutches, etc. Its purpose is to provide an elastic and waterproof protection for belts, etc.

Old scrap or waste rubber, such as old inner tubes of automobile tires, may be used in the composition. The material is first cut up into small pieces and then heated in an ordinary kettle to the desired temperature. The heat used is great enough to reduce the rubber to the liquid condition. Old rubber, which has been subjected to more or less oxidation due to exposure to air, is used preferably, as it produces a somewhat superior product. Old rubber which contains such substances as zinc oxide, sulphate of barium, lampblack, etc., gives good results.

A thick, heavy liquid substance is produced by the fusing process, which is no longer rubber but which is of very heavy consistency, highly adhesive, of a water proofing nature and capable of adhering strongly to surfaces and of forming a frictional coating on them.

Action of Sulphuric Acid on Natural and Artificial Rubber

An article has appeared in the *Kolloid Zeitschrift*, 1922, pages 176-186, which gives an account of some very interesting experiments made to determine the action of sulphuric acid on natural rubber and factice. It was found that the action of concentrated sulphuric on the solution of rubber in benzene, carbon tetrachloride or carbon disulphide was such as to convert it into a yellowish white product, which could be easily reduced to the form of a powder. A part of this product is soluble in acetone. This part must differ from rubber in the loss of three double bonds, as is shown by studying the action of bromine on the substances. The insoluble part is studied as well and some interesting conclusions are drawn regarding the constitution of the rubber molecule.

Hydrogenation of Rubber

In Hevetia Chimica Acta, 1922, pages 785-806 there is given a very interesting account of the hydrogenation of rubber and the properties of the compound that is formed in this manner. Complete hydrogenation was obtained by treating the rubber (pure plantation rubber was used) with hydrogen in the presence of platinum at a temperature of 270 degrees C and a pressure of about 100 atmospheres. The composition of the hydrogenated rubber was examined. It was found that hydrogenated rubber does not possess the elastic properties of ordinary rubber, but it still is a colloid. It forms colloidal solutions in various solvents, in benzene, ether, etc. Bromine attacks it but it is unattacked by vulcanizing agents.

Colored Rubber Substitute

The process, that is described in German Patent No. 356,-165, is concerned with the production of colored rubber substitutes, in which the color is not changed during the subsequent vulcanization process. The finely divided factice is dyed in level shades by the aid of various organic dyestuffs, particularly those of the indigo series.

Restoring Elasticity of Inner Tubes

A process has been patented in England, (see British Patent No. 177,495) for restoring or improving the elasticity of rubber, particularly of worn out inner tubes of automobile tires. The material used for this purpose consists of a decoction of Roman camomile in rectified castor oil. The mixture is made by thoroughly stirring one gram of the camomile into five liters of castor oil. The operation takes about one hour and the resulting mass is then poured into 15 liters of fresh untreated castor oil.

The inner tube is treated with this oil, after it has been heated to about 80 degrees. The oil is placed within the tube and the surfaces of the latter are rubbed together so as to secure a good impregnation of the mixture. The tube is then placed in baths of the oil for a certain definite period in each. The first bath is heated to 50 degrees C and the tube is allowed to remain in it for half an hour; the second bath is maintained at 70 degrees and the tube is permitted to stay for 15 minutes; the last bath is kept at 80 degrees and the tube is immersed therein for only 10 minutes. About 24 hours are allowed to elapse between each immersion. The surplus oil is then removed and the tube is ready for use. The elasticity of a new tube is enhanced by immersing the same in oil at 80 degrees for about 10 minutes.

Permeable Rubber Composition Sheets

The well-known impermeability of rubber to air and gases is remedied in cases where permeability is desired by incorporating with the plastic material a filler holding a liquid or gaseous pore-producing agent. The sheet that is made with this mixture is set in a pliable permeable condition. The sheet is preferable made or applied to a fabric background. For example, 100 parts of pale crepe rubber, 10 parts of zinc oxide, 4 parts of para-toluidine, 2 parts of sulphur, 4 parts of "dibutyldixanthic disulphide" are mixed together with enough solvent naphtha to make a pasty mass. Then 100 parts of cotton fiber saturated with water are mixed with this composition. The mass is then calendered on to a fabric which has been previously thinly coated with rubber. The sheet may be embossed and varnished, and then is heated to expel the water and thus form pores. The vulcanization of the mixture takes place at a temperature of 200 degrees F. See British Patent No. 177,778.

Vulcanization of Rubber

According to British Patent No. 185,590 vulcanization is effected in a medium consisting of the eutectic alloy of tin (nine parts), lead (sixteen parts) and cadmium (nine parts). This alloy has the melting point of 145 degrees C. The melting of a sufficient proportion of the alloy to maintain the temperature during the required period of solidification is accomplished by means of an immersed, insulated, electrically heated wire. In order to shorten the time of the vulcanization process, an alloy, which contains 57 per cent of tin, 21 per cent of lead and 22 per cent of cadmium is employed. This alloy has a solidification range of from 153 degrees C. to 145 degrees C. An apparatus for carrying out the process is also described in the patent.

Rubber Used in Violin Manufacture

A new use for rubber in the manufacture of violins and other similar musical instruments is patented in British Patent No. 174,031. The violins are covered with a coating of rubber or a mixture containing a rubber base, preferably before varnishing and polishing them. It is claimed that the tone of the instrument is improved by this treatment.

Scientific Method in Rubber Compounding

Conditions which Confront the Compounder and Data to Help Him Meet the Demands of Service and Competition

By C. O. North

The Rubber Service Laboratories Co., Inc., Akron, Ohio

VERY satisfactory progress has been made during the past few years in applying scientific methods to the problems of rubber compounding. This has been made possible through the development of new and improved methods of rubber testing which in turn have furnished us with a clearer conception of the underlying principles of compounding.

The first chemists to make a study of the art of compounding had before them the picture of steel. They were of the opinion that the problems of rubber could be solved in a similar manner and consequently laid great stress on the development and application of chemical analysis. For example, they thought that coefficient of vulcanization was by far the best index of state of cure. They failed to realize that in rubber we have a mingling of both chemistry and physics. While strictly chemical problems are met in the vulcanizing reactions, yet the effects of pigments and other compounding ingredients belong within the field of physics. The coefficient of vulcanization is merely a measure of the quantity of sulphur which has become added to rubber. It is in no way a measure of the state of technical cure because of the factor known as depolymerization.

Effects of Temperature and Type of Accelerator

It is now generally understood that in vulcanizing or curing we have two effects which work in opposite directions. Depolymerization or the reduction in size of the colloidal aggregates of rubber is a factor which tends to weaken or deteriorate the final product. It is influenced primarily by heat and the time of heating. For example, it is not a factor at cures made at 10 and 20 pounds of steam pressure (namely, 239.4° and 258.8° F., respectively). This statement applies even when the time of heating is as long as from 3 to 5 hours. As the temperature rises, the time within which depolymerization is not a decided factor grows smaller and smaller. At 40 pounds steam (287° F.) the range is from 1 hour to 1 hour 30 minutes. At 60 pounds (307° F.) it has narrowed down to from 15 to 30 minutes. The higher the temperature, the shorter becomes the time within which rubber may be heated without serious deterioration.

Another factor which affects depolymerization is the type of accelerator employed. For example, *p*-nitrosodimethylaniline is a violent depolymerizer, as are several softeners or fluxing materials which are sometimes added to a compound for the purpose of making it easier to handle in the factory. Some softeners are powerful depolymerizers, others have little effect. For example, paraffin is quite pronounced in its action, but castor oil is quite inert.

Opposed to the depolymerization action of heat and certain substances, we have vulcanization which ordinarily means sulphur addition. While we know many ways of reducing the size of the colloidal aggregates of rubber, yet we are limited to sulphur and sulphur chloride for commercial methods of linking them into larger units. Since vulcanization by sulphur chloride has such a small number of applications, it may be practically disregarded. Sulphur then is the principal depolymerizer. It counteracts the effects of heating and other depolymerizing influences. As will be readily appreciated, the more sulphur which must combine with rubber to produce technical cure, the poorer the product. For example, reclaims whose poor quality are well known will seldom be

STORAGE ROOM OF A RUBBER FACTORY WHERE THE RAW RUBBER AND THE VARIOUS COMPOUNDING INGREDIENTS ARE STORED IN SEPARATE COMPARTMENTS. THIS ROOM IS OFTEN USED FOR MEASURING AND MIXING THE BATCHES IN PREPARATION FOR THE MILLS

found to have a coefficient of vulcanization under 5. In other words, the combined sulphur will be more than 5 per cent of the rubber present.

On the other hand, Whitby's compounds vulcanized with various dithiocarbamates and cured in from 3 to 5 min. at 287° F. (40 lbs. steam) showed remarkably high tensile strengths with a coefficient of vulcanization seldom over 1.5 and ordinarily less than 1. It is therefore generally realized that the larger the colloidal aggregates in rubber vulcanized to the point of commercial cure, the greater the tensile strength, the resistance to tearing and flexing, and the more pliable and stretchy the article. Certainly when properly vulcanized such compounds have longer life and stand up better in service.

Aside from the advantage and more rapid turning over of equipment, shorter cures at moderate temperatures are very desirable because of the increased service and durability of the product so prepared. It will be remembered that a few years ago 3000 miles was considered a remarkable record for pneumatic tires. In those days the cures were from 3 to 5 hours long. Today a record of 10,000 miles is considered only average. The curing time has been shortened from 3 hours to approximately 1 hour for the small sizes. The large sizes have been reduced in proportion.

While there are other factors which have had a bearing on this problem, the fact remains that rubber cured with the aid of organic accelerators has a lower coefficient of vulcanization than formerly and a higher degree of polymerization than was ever met with in the old days.

Regardless of the advantage of shorter cures, the compounder is limited by the slow heat flow in stocks and fabricated articles. The heat conductivities of both rubber and fabric are low and therefore a very thorough understanding of the temperature effects must be had before one can secure a uniform cure throughout an article. This requires extensive thermocouple measurements and considerable mathematics in working out the generalizations. Fortunately work on this subject is now going forward in the laboratories of several companies and it is hoped within a short time to be able to calculate the temperature at any point within the tire or other article at any time under definite temperature conditions.

Assuming that one has a very thorough knowledge of the temperature conditions, we have then the problem of securing uniform cure throughout the article. For a long time we had to place entire dependence on what is known as a rising or step-up cure. When properly worked out this method does give practically uniform effects but with the introduction of the so-called flat curing accelerators these problems have been solved much more easily. By flat curing accelerators we mean those which are capable of giving uniform physical properties over a long range of time.

An accelerator is known which has a range of from 30 min. to 4 hrs. cure at 40 lbs. or 287° F. Within this range of cures all samples of this stock have shown perfect aging to date. This is really remarkable and certainly helps to smooth off any inequalities left by an improperly gaged rising cure.

Practical Procedure in Compounding

As in other industries the application of the scientific method usually follows the rule-of-thumb experiments carried on by the first investigators. When a compounder has the task of working out compounds and structural features which enter into the construction of an article, as for example a pneumatic tire, he must first familiarize himself with the behavior of articles which have given a good account of themselves in actual service. Thus, if he is working with tires, he will study various makes, determine the average life under different conditions, the rate of tread wear and deflection under which they have been run, the type of roads, and other conditions of service. He will select those tires which have given good service, or, as is usually the case, he will pick out one tire having the most satisfactory tread, another with the better bead or another with a better carcass, and in fact will make a study of the weak points of the articles then in service.

If it is steam hose he will determine the average life both by steaming tests and actual service. His first problem is unquestionably that of service rendered and the manner in which articles of other manufacture have met this service. With the above information he will then make a more careful analysis of the conditions of service and will determine, among other things, the rapidity and extent of flexing, the maximum tensile strains which have been met, the conditions of wear, the ease with which heat may escape whether the service is continuous or intermittent, and he will make a special investigation of all conditions which are somewhat out of the ordinary.

He will then tear down those articles which have given the best service and make a careful analysis of them, basing his decisions both on tests after service has been completed and on the freshly manufactured article. For example, he will determine the tensile strength and ultimate elongation of the different compounds which enter into the article with as much accuracy as is possible. He will determine the stress-strain curves of the different stocks and will make particular note of the load required to produce 300 per cent elongation, which figure many compounders have now come to regard as the best index of stiffness. He will study the characteristics of the hysteresis loop and particularly the ratios of energy input and output at low elongations. Moreover, he will make careful note of the resistance to tearing, to abrasion, and to flexing. These three are perhaps the most important of all, and he will measure these resistances by tests which have recently been developed but which have not yet been standardized. He will determine the rate of plastic flow and of recovery. The union of the different parts of the article to one another will also be very carefully studied. This matter is of maximum importance, particularly in pneumatic and solid tires. Many tires fail through unsatisfactory unions between the plies or between tread and breaker, or between breaker and carcass. In solids a great deal of trouble results from separation between tread and hard rubber. In fact, this is the most serious type of failure and has caused the solid tire companies much concern.

Before going any further into the development of an article to meet any definite set of conditions, the compounder must make a careful study of the conditions of manufacture. Too often are we given to the bad habit of determining what we should have without regard to what we can make. The operations through which different compounds must pass in going from the unmanufactured to the finished state must be carefully worked out. The milling, calendering, and tubing conditions must be thoroughly understood, the curing conditions must be set and the rate of heat flow measured or approximated in order to determine the minimum time and the proper temperature of the cure. Moreover, a compound cannot be considered by itself but always in relation to other stocks and the union which it must make to them. In addition to this, the compounder is limited by competition to a certain definite cost for each stock and if possible he must reduce costs at the same time delivering a product of equal or better quality. Again, appearance is usually a very large factor. He must make a special effort to produce an article pleasing to the eye.

It will be gathered from the above that the conditions which the compounder must meet in order to develop a satisfactory article are not only numerous but difficult to handle. Much of the lack of progress along scientific lines in the past was due largely to the multiplicity of factors which had to be considered.

In compounding to meet the fine conditions of cure, a knowledge of the behavior of accelerators is required, which as yet is little appreciated. Not only must one have at hand a great mass of data obtained at normal curing temperatures, but the behavior of the various accelerators with different sulphur and accelerator ratios to rubber in the presence of various activators, such as zinc oxide, lime, etc., must be known for various temperatures. As a rule it is perfectly satisfactory to work with the temperatures of 50, 40, 30, 20 and 10 lbs. of steam. Certain accelerators will not function below 30 lbs. of steam and there is at least one which is said not to function under 50 lbs. of steam.

After working out the effects of various accelerators and sulphur ratios in simple mixes, it becomes imperative to know the influence of various rubber fillers, oils, greases, and substitutes on such compounds. The principal difference will

be found in the fact that oils, etc., require slightly higher sulphur ratios. With this information as a basis, it is possible to work out compounds which will cure within the desired range of time, and the average compounder will make a special effort to have this range as wide as possible. Certainly there are few purposes for which at least a 2-hr. range cannot be obtained; in other words, a compound which will give equivalent physical properties within a range of 2 hrs. For example, it should be possible for a stock which has certain definite characteristics at 1 hr. to be cured to 3 hrs. without serious change in physical properties. This does not mean of course that one should cure at 3 hrs., but in practically all cases we are much safer in the aging properties of the compound, if, having this range, we then cure to the optimum cure or slightly beyond it.

The next step is arriving at the proper plasticity in the raw stock. This plasticity enters into every phase of the fabrication of the article. For example, a tire friction must be soft enough to run directly on cord fabric without spreading the cords. It must thoroughly penetrate the cords and it must maintain a certain tackiness all the way through to the tire building operations, and at the same time it must not be so sticky as to stick to the liner or to work out badly on the bias cutters. This plasticity is also of importance in making a proper contact with other stocks, which is the first requisite in securing good unions. It also enters into the readiness with which stocks may be run on the calender and tube machines. This requires a very thorough study of softeners and their effects.

Influence of Fillers

From a study of articles and their constituent elements, one can usually arrive at the approximate physical characteristics of the compounds employed. Outside of cure and plasticity, the development of a compound for a certain purpose requires a thorough knowledge of fillers, which may be divided into the active and inert types.

This is hardly the place to go into the reasons for activity or inertness in a pigment but briefly it is now generally understood that activity is very closely tied up with fineness of division and the condition of particle surface. For example, micronex carbon black, which is by far the finest product commercially available at present, has a fineness of division of less than 0.1μ. Moreover, it is reasonable to suppose that its surface is not merely that of a spherical particle but probably is something of the nature of a feather. Regardless of the reason, carbon black continues to be our most important filler and the one which has the greatest toughening effect upon rubber. Within the last few months, however, certain new types of zinc oxide have been brought out which are much finer and carry lower impurities than the older grades and therefore are more reactive and show greater activation effects on accelerators and give higher tensiles and better stiffening action. To date there are no competitors of carbon black and zinc oxide. Clay has been advanced and has been found of value when used in small quantities. While it does have some of the desired stiffening action, yet because of the fact that there are many agglomerates and large particles present which do not disperse well in rubber, it has as yet only limited application in high-grade compounds. Not only must one pay special attention to the fineness of division and surface effects of fillers, but the degree of ease with which these fillers can be dispersed in rubber must be well understood. Dispersion experience in paint, glycerol, water, and other media does not necessarily hold and has little bearing on the ease with which a pigment may be dispersed in rubber. Methods of milling and the softeners employed have a great bearing on the subject and there is hardly a compounder who cannot improve his compounds by improving his milling characteristics.

Of the inert fillers none are very finely divided and consequently they cannot be dispersed very thoroughly in rubber. To this class belong certain grades of whiting, clay, barytes, and others which are used chiefly because they are cheap. In high-grade stocks where severe conditions of service must be met, it is unusual to find them present in any high percentage.

In reference to the rubbers which find the widest application at present it may be stated that one of the outstanding features of our present compounding is the wide use of brown crepe. This rubber mills nicely and furnishes desirable plasticizing properties to the resultant compounds. It is true that it does vary in rate of cure but in the presence of organic accelerators this variation is so masked that it is of little importance. A much more important problem is its variation in plasticity. Many companies are now making plasticity tests by milling a definite weight of rubber under carefully controlled conditions and determining the time required for breaking down to a desired degree.

There was a time when compounding and design were widely separated and there was very little cooperation between the two ends of the business. Fortunately, today the designer has taken up compounding or the compounder has taken up design. It has now become a recognized fact that the success or failure of any rubber article depends not only on the stocks employed and the technic of factory production, but also upon how well the mechanics of the articles have been worked out in perfecting the design. For years we have been putting too much fabric in our tires. This year has seen a decrease in the number of plies and we are soon to decrease the number of cords per inch in the plies. Sea Island and Egyptian cotton were formerly employed exclusively. Today much carded and combed peeler will be found in many of the best tires.

Conclusion

In outlining the above, the writer has made no effort to go into detail on any of the big problems of compounding. His whole aim has been to point out the conditions which confront the compounder and the vast amount of information which he must have at hand in order to successfully meet the conditions of service and competition. It is hoped that this paper will serve as an illustration of the application of the scientific method to one of the most difficult branches of applied engineering.

Mechanical Rubber Goods in England

(By U. S. Consul J. F. Jewell, Birmingham, Eng.)

By reason of the large number of factories in the Birmingham district there is a considerable demand for all kinds of belting. American belting is well established here and seems generally to be preferred when it can be obtained, on account of its superior strength and utility, although it is sold at a price very much higher than British belting. There are several manufacturers of belting in the Birmingham district besides many local branch houses of belting manufacturers located in other parts of the country, and the supply appears to fully meet the demand.

There is also quite a large demand here for linings, clutch rings, clutch facings, and similar automobile goods, as the Birmingham district is one of the centers of the motor-car industry in England and is naturally interested in the sale of American cars and accessories. It appears, however, that most of the repair accessories used to replace worn or broken parts on American cars are supplied by the actual makers of the cars and distributed by the concessionaires in London or Liverpool.

The market for all kinds of hose in the Birmingham district appears to be catered to wholly by British rubber manufacturers, many of whom are established within this area. While this does not necessarily prevent the possibility of American goods being sold here, it should be noted that direct importation of American articles is not carried on extensively in this district, supplies being mainly obtained from distributing agencies and American branch houses located in London or Liverpool and other coastal ports.

American articles of rubber sold in this district include sponges, shoe heels and soles, hot-water bags, bathing caps, tires, and various drug-store accessories. It may be noted that few British rubber manufactures, except golf balls, are exported to the United States from this district.

NEWS OF THE INDUSTRY

BRITISH AND AMERICAN RUBBER COMMITTEES HOLD FIRST MEETINGS

Representatives of the British Rubber Planters Get Together with the Rubber Association Committee for First Meeting on January 19 in New York

The first meeting of the representatives of the British Rubber Growers with the Committee of the Rubber Association of America was held at the Rubber Association offices in the Fisk Building, New York, on Friday, January 19, 1923.

No extended announcement was made of the matters considered at this meeting except the brief statement that facts and figures were presented by both sides for general consideration. No attempt is being made at these preliminary meetings to reach any definite decisions for it is considered unlikely that the British Commission will care to commit itself to any policy without further consultation with the British Growers and Planters and the Rubber Association of London whom it represents.

The British planters, Sir Stanley Bois, H. Eric Miller and P. J. Burgess represent the Rubber Association of London, a group of planters controlling 70 per cent of the world's rubber supply. The American manufacturers represent the Rubber Association of America, whose members are responsible for about 70 per cent of the world's rubber consumption.

American Committee

The American committee is made up of H. Stewart Hotchkiss, vice president of the United States Rubber Company; B. G. Work, president of the B. F. Goodrich Company; William O'Neil, of the General Tire & Rubber Company; C. W. Litchfield, of the Goodyear Tire & Rubber Company; F. H. Brown, of Meyer & Brown, Inc.; William B. Pfeiffer, of the Miller Rubber Company, and Horace De Lisser, of the Ajax Rubber Company.

The American manufacturers have no expectation of appealing to Washington for assistance. There is a feeling of certainty among them that a full demonstration of the situation in this country will go a long way toward clearing up the present difficulties.

The British committee is authorized only to report back to the Rubber Association of London. It is possible, however, that the association may appeal to the authorities for Ceylon and the Malay States, which imposed the restrictive export tariff on rubber, to repeal it.

No Need for Protection

The American Committee pointed out to the British that there really is no need for the protection which the tariff provides, but that it will actually work considerable harm by decreasing production to such an extent that the supply will not equal the demand, which is already far above any requirements during the past four years and is expected to continue its growth.

If it can be brought to their attention that the demand in this country is greatly in excess of the supply likely to be produced, a modification of the tax may be brought about and restrictive clauses in the law removed. The American manufacturers feel that a free and unhampered production of rubber is the only way of assuring a stable price in rubber commodities to the consumer.

Just how much the visiting committee can do is highly problematical. They are themselves not in a position to say that the restrictions will be removed. The export duty is a governmental structure, and it would be necessary for the governments of Ceylon and the Malay States to take separate action, just as they did in imposing the tariff, to remove it at this time.

The committees left for Trenton on Monday morning and returned on Tuesday afternoon, January 23. After a tour of the Trenton rubber factories Sir Stanley Bois stated that he was astounded at the industrial growth of the United States since his last visit in 1909. "Prior to sailing to America I made a thorough inspection of English rubber factories," said Sir Stanley, "and after comparison with your thriving wide-awake concerns my hat is off to America."

Wednesday night the committees left for Akron, followed by a trip to Detroit, Buffalo, New York and probably a trip to Washington early in February for a conference with Secretary Hoover.

Directors Sue Goodyear for $493,082

As an aftermath of four suits filed against Goodyear by Mrs. Laura L. T. Weiss of Cleveland, attacking the reorganization and refinancing plans of the company, two of the directors, Francis Seiberling and Russell L. Robinson, have filed suit for $493,082, charging fraud, concealment, and secret domination of the board of directors by Wall Street interests. The amount sued for represents the difference between the total sum paid Leonard Kennedy & Co. and $65,000 paid for officers' salaries—$50,000 to E. G. Wilmer, the president, and $15,000 to P. H. Hart, the treasurer, both of whom were supplied by the Kennedy concern. The Kennedy company is said to be controlled by Clarence Dillon, president of Dillon, Reed & Co., New York bankers and brokers.

International in Good Shape

Since the reorganization of the International Rubber Co., Anderson, Ind., on April 7, 1922, the gross sales up to Dec. 30 last were $790,492.81 and the gross operating profits $95,857.52. The bank indebtedness has been paid and the company has a cash reserve of $12,358. The company is producing 1,000 tire casings daily and in another month will turn out that many inner tubes. Capacity may be increased fifty per cent a little later.

U. S. Rubber Financially Sound

According to advance figures published in the *Wall Street Journal* of Jan. 8, the financial statement of the United States Rubber Co. for 1922 will show net earnings for the year of more than $7,000,000. After paying preferred dividends of $5,400,000, the surplus will be equivalent to about $2 a share on the $81,000,000 common stock outstanding. Net sales for the year were about $167,000,000 compared with $164,470,368 in 1921. Bank loans were reduced $11,000,000 to a figure of about $25,000.000. Notes payable were reduced from $36,210,000 to $34,990,000 on June 30 last.

Smith Plant Sold

The plant of the Smith Rubber & Tire Co., Rutherford, N. J., valued at more than $500,000, has been purchased by a syndicate headed by A. Brooklyn of Passaic, N. J., for $114,500. The property includes seven and one-half acres of land. It was not stated what the syndicate intended doing with the plant.

News Notes of the Rubber Association

AT the organization meeting of the Board of Directors of The Rubber Association of America, Inc., held at the Waldorf-Astoria Hotel, New York City, on the afternoon of January 8, Horace DeLisser, chairman of the board of the Ajax Rubber Company, was elected president of the Association for the year 1923, succeeding Harry T. Dunn, president of the Fisk Rubber Company, who has served in that capacity for the past two years. W. O. Rutherford, vice president of The B. F. Goodrich Co., was selected as the first vice president and G. M. Stadelman, vice president of the Goodyear Tire & Rubber Co., as the second vice-president. A. L. Viles was re-elected general manager and secretary, and G. B. Hodgman, president of the Hodgman Rubber Co., treasurer of the association.

Tire Manufacturers' Division

The annual meeting of the Tire Manufacturers' Division was held at the Yale Club, January 9, at 1 p. m.

To succeed J. C. Weston as chairman of the division E. H. Broadwell, vice president of the Fisk Rubber Co., was elected to that office, with L. G. Fairbank, general sales manager of the Firestone Tire & Rubber Co., as vice chairman, succeeding J. V. Mowe, of the Kelly-Springfield Tire Co. The following named companies were elected members of the executive committee of the Tire Manufacturers' Division for the year 1923:

Fisk Rubber Co., Firestone Tire & Rubber Co., Ajax Rubber Co., Inc., General Tire & Rubber Co., The B. F. Goodrich Co., Goodyear Tire & Rubber Co., Hewitt Rubber Co., Hood Rubber Co., Kelly-Springfield Tire Co., Lee Tire & Rubber Co., Michelin Tire Co., Miller Rubber Co., Norwalk Tire & Rubber Co., Pennsylvania Rubber Co., Seiberling Rubber Co., Swinehart Tire & Rubber Co., United States Tire Co.

Foreign Trade Division

The annual meeting of the Foreign Trade Division was held at the Yale Club, January 8, at 12 m.

A. G. Cameron, of the Goodyear Tire & Rubber Export Co., was elected chairman of the division to succeed F. E. Titus of the International B. F. Goodrich Rubber Corp., and K. S. Chamberlain of the Fisk Rubber Co., was elected vice chairman to succeed H. G. Lubke, of the General Tire & Rubber Co. The following named were elected members of the executive committee of the division for the year 1923:

A. G. Cameron, Goodyear Tire & Rubber Export Co.; K. S. Chamberlain, Fisk Rubber Co.; A. R. Gormully, Ajax Rubber Co.; C. E. Wagner, Miller Rubber Co.; E. Salisbury, Brunswick-Balke-Collender Co.; D. D. F. Yard, Pennsylvania Rubber Co.; E. H. Huxley, United States Rubber Export Co.; Sam Broers, Firestone Tire & Rubber Co. Ex Officio—F. E. Titus, International B. F. Goodrich Corp.

Rubber Proofers Division

The annual meeting of the Rubber Proofers Division was held at the Yale Club at 12 m. January 9.

J. H. Mason, of the Vulcan Proofing Co., was re-elected chairman of the division and Warren MacPherson of the Cambridge Rubber Co., vice chairman. The other members of the executive committee are:

N. L. Green, Clifton Manufacturing Co.; L. A. Beecher, J. C. Haartz, Inc.; S. G. Byam, Plymouth Rubber Co.

Mechanical Rubber Goods Manufacturers' Division

The annual meeting of the Mechanical Rubber Goods Manufacturers' Division was held at the Yale Club, 10 a. m., January 8.

C. E. Cook, vice president of the B. F. Goodrich Co., and C. D. Garretson, general manager and treasurer of the Electric Hose & Rubber Co., were re-elected chairman and vice chairman, respectively, of the division for the year 1923. The following named, with the chairman and vice-chairman, compose the executive committee of the division:

J. H. Cobb, New York Belting & Packing Co.; G. E. Hall, Boston Woven Hose & Rubber Co.; D. R. Burr, Goodyear Tire & Rubber Co.; J. A. Lambert, Acme Rubber Mfg. Co.; F. D. Voorhees, Voorhees Rubber Manufacturing Co.; C. C. Case, United States Rubber Co.; J. H. Kelly, Hewitt Rubber Co.

Rubber Sundries Manufacturers' Division

The annual meeting of the Rubber Sundries Manufacturers' Division was held at the Yale Club, January 9, at 1 p. m.

W. H. Balch, of the Faultless Rubber Co., was elected chairman of the division for the year 1923, succeeding H. A. Bauman of The B. F. Goodrich Co. W. S. Davison of the Miller Rubber Co. was elected vice chairman. With the chairman and vice chairman, the following named compose the executive committee for the ensuing year:

H. A. Bauman, The B. F. Goodrich Co.; F. H. Jones, Tyer Rubber Co.; P. R. Wesley, Davol Rubber Co.; J. W. Kuhne, Hodgman Rubber Co.; H. H. Reddy, Whitall-Tatum Co.

Rubber Reclaimers' Division

The annual meeting of the Rubber Reclaimers' Division was held at the Yale Club, January 8, at 10 a. m.

Clark W. Harrison, of the Bloomingdale Rubber Co., and L. J. Plumb, of the United States Rubber Reclaiming Co., were re-elected chairman and vice chairman, respectively of the division for 1923. With the chairman and vice chairman, the following named compose the executive committee of the division:

E. E. Hall, Boston Woven Hose & Rubber Co.; E. A. Anderson, Rubber Regenerating Co.; J. S. Lowman, Philadelphia Rubber Works Co.; J. S. Clapp, E. H. Clapp Rubber Co.; Joseph F. McLean, Pequanoc Rubber Co.

Hard Rubber Division

The annual meeeting of the Hard Rubber Division was held at the Yale Club, January 8, at 10 a. m.

McConnell Shank, of The B. F. Goodrich Co., was elected chairman of the division for the year 1923, to succeed Harry Weida of the United States Rubber Co.

Footwear Division

The annual meeting of the Footwear Division was held at the Yale Club, January 8, at 12 m.

George H. Mayo, vice president of the United States Rubber Co., and F. S. Dane, of the Hood Rubber Co., were re-elected chairman and vice chairman respectively, of the division for the year 1923.

Special Crude Rubber Committe

The Special Crude Rubber Committee, appointed by the board of directors of the association to handle the question of the restriction of crude rubber production by the British Government, which was composed of (Chairman) H. Stuart Hotchkiss, President, General Rubber Co.; B. G. Work, President, The B. F. Goodrich Co.; Horace DeLisser, Chairman of the Board-Ajax Rubber Co.; A. H. Brown, Meyer & Brown was enlarged to include P. W. Litchfield, Goodyear Tire & Rubber Co.; William O'Neil, General Tire & Rubber Co.

11,500,000 Autos in U. S.

The National Automobile Chamber of Commerce estimates that more than ninety per cent of the world's motor vehicles are registered in the United States. The world total is now placed at 12,750,000 of which 11,500,000 are in this country. This represents an increase of more than 1,000,000 cars and trucks over 1922. Last year's production of passenger cars was 2,287,000 valued at $1,374,487,000 and 240,000 trucks valued at $184,080,000. Both represent large gains over the 1921 output.

U. S. Rubber Dividend

On Jan. 4 the directors of the United States Rubber Co. declared a quarterly dividend of two per cent on the first preferred stock of the company, to stockholders of record on Jan. 15, payable on Jan. 31.

Old O'Sullivan Co. Dissolved

The original O'Sullivan Rubber Co., organized in Maine in 1899 with a capital stock of $50,000, has been dissolved by request of the stockholders. The present O'Sullivan company, which made the rubber heel famous through its advertising, is a very much larger concern.

Raincoat Plant for Sandusky

The New London Mfg. Co. of New London, Ohio, is moving its raincoat factory to Sandusky. R. R. Samford is president of the concern.

Mason Signs $30,000 Lease

Mason Tire & Rubber Co., has signed a five-year lease for a store at 314 West Fourth street, Cincinnati, at a total rental of $30,000. The store is in the downtown section of the city.

Personals

W. O. Rutherford, vice president of Goodrich, has been elected president of the Motor and Accessory Manufacturers Association. He succeeds E. H. Broadwell, vice president and general manager of Fisk, who was president for two years. Mr. Broadwell remains one of the directors of the organization.

* * *

Harry L. Post has been chosen by the Seiberling directors to succeed the late Irving R. Bailey as vice president in charge of sales. Seiberling sales for this year are estimated at $9,000,000.

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Fred W. Gorman is the new southern district manager for Star, with Atlanta headquarters. He was formerly with Brunswick and Dayton.

* * *

E. L. Rimbault is the new manager of intermediates and food colors for the National Aniline & Chemical Co., Inc., New York. He was formerly reclamation manager at the Buffalo plant.

* * *

E. M. MacIntosh, Goodyear foreign representative, recently returned from an eighteen months' world tour, addressed the Akron Rotary Club on European conditions. He took a pessimistic view of most of the European countries, but foresaw "China and Japan rising as mighty factors in world affairs of the future."

* * *

John G. Gates, treasurer of the Gates Rubber Co., Denver, Colo., was a recent visitor at the Goodyear plant at Akron.

* * *

Marcel Marin, sub-director of Goodrich at the Colombes, France, plant, was a recent Akron visitor, studying methods of rubber manufacture in the various factories. He was in the French submarine and aviation services during the war, receiving the Croix de Guerre and the military medal.

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Isaac F. Marcosson, noted journalist and magazine writer, lectured at the Goodyear Theater in Akron recently on "The German Collapse and World Security." He made an inspection tour of the Goodyear plant.

* * *

Harry L. Arbogast, technical director of American, spoke to the members of the chemistry club at Akron University recently.

* * *

The rubber division of the Brunswick-Balke-Collender Co., Chicago, announces the following additions to its sales force: W. J. Ryan, district sales manager for Indiana, headquarters at Indianapolis; R. T. Jollie, Jr., sales manager for Ohio, with general supervision of Cleveland and Cincinnati branches; Richard E. Cameron, district sales manager for Illinois, headquarters at Chicago; Frank F. Marsh southeastern sales manager, headquarters at Atlanta, Ga.

SIR ERIC GEDDES, G.C.B., G.B.E.,
New Chairman of Board of Dunlop Tire and Rubber Co., Buffalo, N. Y.

V. I. Montenyohl, assistant treasurer of Goodrich, has returned from an extensive business trip to eastern cities.

* * *

A. L. Stewart has resigned from the Mid-West Tire & Sales Co. to take a position as district sales manager for the Iowa Cord Tire Co. covering Iowa and Illinois. Frank Kathman succeeds him as manager of Mid-West, with H. A. Ippensen assistant manager.

* * *

T. Poole has been appointed special representative for the company in New York.

* * *

James W. Barry, Mohawk representative, is now with San Francisco branch.

* * *

James E. Daven, formerly with Mohawk, and later with Amazon, is now with Brunswick-Balk-Collender Co.

* * *

Harry A. Bell, for thirteen years superintendent of the Revere Rubber Co., Chelsea, Mass., has gone to Chicago to become factory manager of the local factory of the United States Rubber Co. A dinner and a gift from his former associates preceded his departure from the east.

Odell Expansion

The Odell Rubber Co., South Bend, Ind., is submitting a re-capitalization plan to its stockholders' meeting in January. In the middle west 1400 new tire dealers were added in 1922. A new addition to the plant will increase its capacity one-third. This is the second addition to the factory within a year.

Wishnick Now Sales Agents for Chicago Color Works

The Wishnick Tumpeer Chemical Co. has been appointed sole selling agents for the products manufactured by the Chicago Color Works at Waukegan, Ill., which has been manufacturing a fer-ox yellow and fer-ox red. These colors are specially prepared iron oxides containing maximum percentage of iron oxide and are specially adapted for use in paint and rubber.

Arrangements have been made by the Wishnick Tumpeer Chemical Co. to carry stocks at their Cleveland and Chicago warehouses for the convenience of the trade. They are prepared to take care of all orders promptly.

Fisk Rubber Orders Increase

Announcement has been made by the Fisk Rubber Company that its present orders are 78 per cent larger than at this time last year and that its plants at Chicopee Falls, Springfield, Mass., Pawtucket, R. I., and Milwaukee, Wis., are operating at nearly capacity. The company's daily capacity is 24,500 casings and 32,500 tubes it is stated.

Lee Pays Dividend

New York, January 18, 1923—The directors of the Lee Rubber & Tire Corporation have this day declared a dividend of fifty cents (50c) a share on the capital stock of this company, payable March 1, 1923, to stockholders of record at the close of business February 15, 1923.

Kenyon Paymasters Robbed

Two paymasters of the C. Kenyon Co., Brooklyn, N. Y., manufacturers of tires, raincoats, and other rubber goods, were robbed of $10,000 by six hold-up men on Jan. 16. The payroll stolen was that intended for the 450 men in the tire factory.

GOODYEAR FLYING SQUADRON GETS COMPLETE TIRE-MAKING EDUCATION

GOODYEAR Flying Squadron students, in class work, given them afternoons at Goodyear Industrial University, Akron, are carried through the stages of tire making step by step, from the gathering of rubber to the finished tire. The work is explained to them through the use of pamphlets, covering each stage.

A pamphlet is first issued on crude rubber, its collection, cultivation of trees, method of coagulation, etc.

The next pamphlet is of compounding, dealing with the materials used for compounding rubber with the amounts of foreign substances used.

The third pamphlet covers various kinds of cotton, method of planting, cultivation and preparation of cotton fabric for tire building.

The final pamphlet tells of the correct manner of vulcanization and care of tires.

Crude Rubber Import Statistics

Importations of Crude Rubber into the United States December, 1922

(Estimated net weights—long tons.)

PLANTATIONS

FROM	TONS
Batavia	1,805
Belawan-Deli	2,398
Cochin	42
Colombo	3,425
Hamburg	19
Japan and Others	80
London	988
Malacca	1,805
Penang	2,999
Port Dickson	408
Pt. Swettenham	2,014
Rotterdam	1,324
Singapore	17,308
Sourabaya	935
	35,550

AFRICANS

FROM	TONS
Antwerp	191
Bordeaux	147
Hamburg	96
Lisbon	9
Liverpool	141
London	13
	597

CENTRALS AND GUAYULE

Centrals (Mexico and Central America)	80
Guayule (Mexico)	
	80

PARAS

Iquitos	7
Manoas	850
Montevideo	2
Para	797
Rio de Janeiro	229
	1,885

GUMS, WASTE RUBBER, ETC., IMPORTED FROM VARIOUS SOURCES

	TONS
Waste	68
Balata	78
Miscellaneous Gums	728

Comparison 1921-1922

	DEC.-1921	DEC.-1922	Total Importations 12 months ending, Dec. 31. 1921	1922
Plantations	23,596	35,550	173,975	276,649
Paras	597	1,885	10,915	11,092
Africans	493	597	2,329	2,691
Central	2	80	81	135
Guayule	—	—	58	281
Manicoba and) Matto Grosso)	2	—	5	122
	24,690	38,112	187,363	290,970

ARRIVALS PLANTATIONS FOR DECEMBER, 1922, SHOWING PORTS OF ORIGIN AND ARRIVAL

FROM	ARRIVED AT	TONS
Batavia	New York	1,805
Belawan-Deli	New York	2,398
Cochin	New York	42
Colombo	Boston	46
Colombo	New York	3,379
Hamburg	New York	19
Japan and Others	New York	80
London	Boston	68
London	New York	920
Malacca	Boston	425
Malacca	New York	1,380
Penang	Boston	41
Penang	New York	2,958
Port Dickson	Boston	60
Port Dickson	New York	348
Port Swettenham	Boston	8
Port Swettenham	New York	2,006
Rotterdam	New York	1,324
Singapore	Baltimore	514
Singapore	Boston	367
Singapore	New York	15,728
Singapore	Los Angeles	699
Sourabaya	New York	935
		35,550

ARRIVALS OF PLANTATIONS BY PORTS

Atlantic Ports		
New York	33,322	
Baltimore	514	
Boston	1,015	
		34,851
Pacific Ports		
Los Angeles	699	
		35,550

For Year Ended December 31, 1922.

MONTH	Plantations	Paras	Africans	Centrals	Guayule	Manicoba and Matto Grosso
January	20,774	916	161	16	—	—
February	27,270	1,347	301	14	—	41
March	27,711	451	326	3	154	57
April	13,910	462	5	2	65	—
May	19,485	1,072	3	—	62	—
June	14,851	861	14	3	—	21
July	24,563	575	102	2	—	3
August	20,462	1,175	119	8	—	—
September	27,899	342	47	—	—	—
October	22,386	957	599	3	—	—
November	21,788	1,049	417	4	—	—
December	35,550	1,885	597	80	—	—
TOTALS	276,649	11,092	2,691	135	281	122

GRAND TOTAL—290,970 long tons

By Months (all grades)

January	21,867
February	28,973
March	28,702
April	14,444
May	20,622
June	15,750
July	25,245
August	21,764
September	28,288
October	23,945
November	23,258
December	38,112
TOTAL	290,970

Arrivals of Plantations by Ports for Year 1922

Baltimore	1,767
Boston	5,446
Los Angeles	3,474
New York	265,496
San Francisco	55
Seattle	367
Tacoma	16
Vancouver	28
TOTAL	276,649

Figures compiled by the Rubber Association of America, Inc.

U. S. Rubber Wins Heel Suit

The federal circuit court of appeals at Chicago has reversed the decree of the lower court which found that the U. S. Rubber Co.'s concave-convex heel infringed the I. T. S. Rubber Co. patent. The sales of this heel are said to form but a small part of the former company's rubber heel business.

Anti-Trust Suit against Penn. Rubber

The attorney general of the state of Texas has filed an anti-trust suit in the Travis County district court against the Pennsylvania Rubber Co., charging that illegal contracts have been made with distributors of the company in Texas for the sale of its products.

5,000,000 Balloon Contract

The Norwalk Rubber Toy Co., Norwalk, Ohio, has placed a contract with the Frederick Machine Works, of that city, for stamping 5,000,000 pieces of rubber used on toy balloons. Charles Frederick of the latter concern has perfected a machine to stamp 10,000 pieces of rubber per hour. He declares rubber is harder to work with than steel.

Tariff Commission to Study Rubber

A report from Washington, D. C., is to the effect that the Tariff Commission may come to the aid of American rubber manufacturers in their opposition to British control of the world's supply of crude rubber, by making a study of the rubber situation with a view to offsetting the export duties now in force in three British colonies. It is not known at this time what form this assistance might assume.

1923 Dutch Crop Sold at 7¼ d.

The entire 1923 output of rubber from the Netherlands East Indies government rubber estates has been sold on future contract at 40 guilder cents per half kilo (just over 7¼ d. per pound). This is less than half the prevailing market price in London.

Goodyear Vetoes Wage Raise

The board of directors of Goodyear has sustained Factory Manager Litchfield in his refusal to grant the ten per cent increase in wages asked by the members of the industrial assembly. The board's statement declares that "in the opinion of the management there has been no change in business conditions, cost of living, or rate of wages prevailing throughout the country or in Akron to warrant the increase asked for."

$10,000 Fire Loss at Goodyear

Fire in the chemical department of the Goodyear plant at Akron caused a loss estimated at $10,000 on Jan. 2. No one was injured. The damage was covered by insurance.

Fisk Shows Foresight

The Fisk Rubber Co. is reported to have acquired a six months' supply of crude rubber at the low market prices which prevailed last summer. Quotations are now more than double the price paid by the company for some of its raw rubber.

Master Reorganization

The Master Tire & Rubber Co., Dayton, Ohio, has reorganized with C. L. Cappel as president and J. A. Wortman secretary and treasurer. W. E. Stock, former assistant sales manager of Gordon, is the new sales manager. The Miami cord tire, with black over-all tread, will be featured.

Busy Days at Savage's

The Spreckels Savage Tire Co., San Diego, Calif., reports busy times at this plant, the most southwesterly tire factory in the United States. Recent new equipment includes a number of fifteen-foot vulcanizing kettles, each weighing seventeen tons, and other tire-building machinery. The "Trailmaker" is a new black cord tire added to the line. The company looks forward to a big year in the tire trade.

JAPENESE JITNEYS TO OPEN NEW TIRE FIELD

AN American automotive engineer, according to Firestone reports, is designing a new vehicle, designed to take the place of the Japanese ricksha. The new vehicle is called he jitsuyo, perhaps Japanese slang for jitney, and will require tires.

There is no steering wheel but, like the American electries, it is guided with a handle held in the left hand. The clutch, brake, and gear shift levers are eliminated, the entire control being accomplished by a lever on the right.

The wheelbase of the jitsuyo is 72 inches and the tread 38 inches. No garages are needed because the machine can be kept in the ordinary doorway.

The Firestone export representative, reporting on this new arrival in motordom, sees another field opened for pneumatic tires and tire accessories.

Excel's $125,000 Bond Mortgage

The Excel Tire & Rubber Co., Wadsworth, Ohio, is placing a bond mortgage upon its plant amounting to $125,000. The bonds will bear seven per cent interest and mature in ten years.

Mason Loses $25,000 Suit

John N. Lansinger of Kent, Ohio, who as acting fire chief at the Mason fire on June 7, 1920, suffered serious burns, has won a verdict in the Ohio Supreme Court against the Mason company in an amount of more than $25,000. The case was tried and appealed twice.

American's 27th Dividend

On Dec. 21 the directors of the American Rubber & Tire Co., Akron, declared the twenty-seventh consecutive dividend on the outstanding preferred stock of the company, for the quarter ending Dec. 31, payable Jan. 1, at the annual rate of eight per cent.

Last Minute News

Goodyear Stock Retirement

Directors of the Goodyear Tire and Rubber Company met in New York City on January 24 and authorized the retirement of part of the company's outstanding prior preference stock, this stock having been issued in payment for merchandise creditors at the time of the reorganization of the concern. No action was taken in connection with the inauguration of dividends on this stock.

Following the meeting E. G. Wilmer, President of the company, issued the following statement:

"At a meeting of the Board of Directors of the Goodyear Tire and Rubber Company, held today, authorization was given for the purchase and retirement of $9,902,500 par value of the prior preference stock, leaving a total amount outstanding of $20,000,000. The stock so retired cancels accrued dividends thereon to Jan. 1, 1923, of approximately $1,585,000. Provision was also authorized for the sinking fund of $2,500,000 for the company's debentures on March 15.

"The aforesaid retirement, together with bonds already redeemed, means that on March 15 the company will have retired approximately $4,750,000 in aggregate of bonds and debentures and $9,902,500 of prior preference stock, or a total of $14,652,500 of securities created and issued at the time of the reorganization."

* * *

Goodyear Sale of A. C. & Y. and Land Co. Stock

Announcement is made by Goodyear Tire & Rubber Company that a sale of certificates representing Common Stock of the Akron, Canton and Youngstown R. R. Co. and Common Stock of the East Akron Land Co., will be made to the highest bidder at the County Court House in Akron on February 10, 1923 at 10 A. M. Further details may be obtained from C. F. Stone, at the office of The Goodyear Tire & Rubber Co., No. 1144 East Market Street, in Akron, Ohio; E. L. Williams, at the office of Cotton & Franklin, 43 Exchange Place, New York; or from W. B. Cockley, at the office of Messrs. Tolles, Hogsett, Ginn & Morley, in the Williamson Building, Cleveland, Ohio.

* * *

The Star Rubber Company has added Fred W. Gorman to its sales personnel as Southern District Manager with headquarters at Atlanta. Mr. Gorman's considerable experience in the tire business includes successful terms with Brunswick and Dayton.

* * *

J. A. Bowerman has resigned his position with the Fisk Division of The Fisk Rubber Company at Chicopee Falls, Mass. Mr. Bowerman has been with the company for five years during the last three of which he served in the capacity of Assistant General Production Superintendent.

* * *

E. L. Rimbault, formerly Reclamation Manager of the National Aniline & Chemical Company, Inc., at the Buffalo Plant, has been appointed Manager of the Intermediates and Certified Food Color Divisions. Mr. Rimbault will be located at the main office of the company at 40 Rector Street, New York, N. Y.

The products of this division will be sold and distributed as in the past, through the main and branch offices.

* * *

At the annual meeting of the Greater New York Tire Dealers' Association, held on January 17, new officers for the ensuing year were elected as follows: President, Walter E. Layman; Secretary, R. H. Johnston; Treasurer, John F. Boh; Directors: G. D. Brown, G. J. Burger, A. W. Delaney, H. J. Dornan, O. Goldberger, D. T. Morris and W. C. Reynolds.

MARKETS

Cottons and Fabrics

NEW YORK, January, 18, 1923

THE last day of the period under review was the most interesting of all when after days of erratic fluctuations cotton suddenly developed aggressive strength and made new high records in the most active session of the season. The three active positions sold above 28 cents. A year ago the present crop was selling at 15¾ cents. The latest ginning figures showing the quantity of cotton which passed through up to January 1 did not hold out any hope of a yield beyond that estimated. The total accounted for 9,598,907 bales.

Cotton consumed during December showed a falling off of 50,000 bales compared with November but was 17,000 bales more than in December, 1921. Cotton shipments to New England since January 1 have been heavy and the mills in general throughout that territory have for some time and are still operating on a full time basis.

Total production of cotton for the 1922-23 season, in the countries producing over 90 per cent of the world's crop in the pre-war period, is estimated at 15,250,000 bales. This is an increase of 2,559,000 bales, about 20 per cent above the production for the same countries last year and a decrease of 3,991,000 bales, or about 21 per cent, from the average production for the five years 1909-13. The total increase in production is accounted for by the larger crop in the United States, which is estimated at 9,964,000 bales, compared with 7,953,641 bales in 1921. The Egyptian crop is placed at 1,015,000 bales in 1922 compared with 684,000 bales in 1921.

Efforts are being made to increase crops abroad owing to the high price of American cotton and the possibility of a scarcity. The British government is about to issue a loan to provide funds for extensive railway developments in the Nile region which will bring about greater cotton production. Australia also has plans under way that are expected to triple the acreage next year.

Less Cotton Consumed in December

American consumption of cotton in December showed a decrease of 49,616 bales compared with November when 577,561 bales were used. The amount—527,945 bales—compares favorably with the total consumed in December, 1921, which was 510,940 bales. Mill stocks increased in December 200,500 bales and were 185,000 bales more than on December 31, 1921; the total at the close of the year in consuming establishments totalling 1,921,295 bales of lint and 123,104 of linters, compared with 1,721,425 of lint and 95,969 of linters on November 30, last year and 1,738,138 of lint and 168,080 of linters on December 31, 1921.

Cotton held in public storage and at compressors on December 31 was 4,074,945 bales of lint and 38,103 of linters, compared with 4,198,095 of lint and 21,634 of linters at the same time last year and 5,206,663 of lint and 171,303 of linters on December 31, 1921. The number of active spindles in the country gained 303,810 in December and was 529,298 greater than in December, 1921.

Exports showed a falling off of 31,972 bales compared with the exports a year ago. The figures are 607,853 bales of lint including 2,445 bales of linters, compared with 639,825 bales, including 4,394 of linters in December, 1921. Total exports from August 1 to January 5 aggregated 2,831,003 bales as compared with 3,017,803 bales for the same period in 1921.

Cotton prices as of January 18 on the New York Cotton Exchange follow:

	Open.	High.	Low.	Close.	Previous Day.
Jan.	27.52	27.90	27.52	27.90	27.28
March	27.75	28.10	27.70	28.05@28.10	27.55
May	27.95	28.30	27.88	28.28@28.30	27.72
July	27.70	28.01	27.62	27.98@28.01	27.43
Oct.	26.15	26.54	26.09	26.50@26.54	27.89

The New York market for spot cotton was steady, 55 points advance, 28.15c for middling upland.

EXTRA STAPLE COTTON

Business in both domestic and Egyptian staples was very quiet during the fortnight and both classes of cotton were somewhat weaker. It was possible to buy medium grade Sak as low as 33 cents but generally 33½ and 34 was asked. Some high grade Sak could be had as low as 36 cents and medium grade uppers was quoted 32 at 32½ cents.

Pimas were just as irregular and number twos sold at 36½ and 37 cents. Number one grade brought from 37½ to 38 cents. The general price for threes was 35 to 35½ cents and fours were offered at 33 cents.

Some high grade Peruvian mitafiffi was offered on spot at 31 cents and strict middling Peruvian Tangris was quoted at 31 to 31½ cents.

Strict middling white extra staple cottons of a very high standard of stapling were quoted as follows:

1 1/8	inch,	32	to 33	cents.
1 3/16	inch,	33½	to 34½	cents.
1 1/4	inch,	35½	to 36½	cents.
1 5/16	inch,	38	to 39	cents.

TIRE FABRICS

Prices of tire fabrics have tended upward and competition on the basis of quality has become quite aggressive and more general since many cost-plus contracts have expired. Many substantial contracts have been made that will run well toward the summer. The feeling is that the market has definitely improved and that soon all the mills will get down to a fixed price program. There has been a complete recovery from the depression of last spring and those plants with a number of unfilled orders on hand are now running night and day. A heavy demand for fabric is looked for from the Dunlop Tire and Rubber Corporation at Buffalo and the best information is that orders will be placed in the spring. In time the Dunlop people will have their own high grade cotton mills to manufacture fabric for their cord tires.

CORD FABRICS

Combed Sakellarides	.80	@	.85
Carded Sakellarides lb.	.75	@	.80
Combed Peeler lb.	.75	@	.78
Carded Peeler lb.	.63	@	.67
Combed Egyptian uppers lb.	.72	@	.77
Carded Egyptian uppers lb.	.68	@	.72

SQUARE WOVEN

17¼-ounce Egyptian uppers, combed lb.	.69	@	.74
17¼-ounce Egyptian uppers, carded lb.	.65	@	.65
17¼-ounce Sakellarides, combed lb.	.77	@	.82
17¼-ounce Sakellarides, carded lb.	.72	@	.77
17¼-ounce Peeler, combed lb.	.73	@	.76
17¼-ounce Peeler, carded lb.	.61	@	.65

SHEETINGS—The market continued very firm with increased interest reported toward the end of the period. There was some 40 inch, 3.60, sold at 13⅞ cents and for 40 inch, 2.85, 16 cents net was asked.

DUCKS—Leading cotton duck mills advanced their prices in all divisions. Single filling of superior construction was advanced ½ cent and enameling duck was raised to 50 and 52 cents. A number of hose and belting duck mills are sold ahead in some instances as far as June.

BURLAPS—Prices were firmly maintained in spots and afloats. At the close of the period January-March shipments were offered by resellers at 7.30 cents for eighths and 8.95 cents for ten and a halfs. December shipments of burlaps from Calcutta to North American ports amounted to 92,000,000 yards which made the grand total of the year 962,000,000 yards against imports totaling 859,000,000 yards in 1921 and the record total of 1,011,000,000 yards in 1920.

Chemicals and Compounding Ingredients

THE INDUSTRIAL CHEMICAL MARKET—NEW YORK, January 18, 1923—There was a rapid improvement in the demand for industrial chemicals the past two weeks and producers were well pleased with the volume and the character of the business done. Steady improvement in industrial conditions was responsible for the splendid recovery from the quiet of the holiday period and will doubtless result in a steady, sustained demand. Consumers were in the field again and there was lively business in spot material. Confidence in the stability of present quotations showed itself in the large contract business that was done; sellers having very fixed ideas of prices on account of higher costs and heavy demand. Where price changes took place, in most cases advances were made. The outlook for good, steady business for 1923 is assured.

ACCELERATORS

Organic

Aldehyde ammonia, crystals	lb.	$ .93 @	—
Aniline oil, bulk basis,	lb.	.16 @	.17
Excellerex,	lb.	.35 @	.45
Formaldehyde-Aniline	lb.	.51 @	—
Hexamethylene-tetramine	lb.	.95 @	.97½
Paraphenylenediamine	lb.	1.50 @	1.55
Thiocarbanilide, kegs	lb.	.27 @	.32
Vulcocene	lb.	.35 @	—

Inorganic

Lead, sublimed blue	lb.	.08 @	—
Lead, white	lb.	.08 @	—
Litharge, domestic	lb.	.10¼ @	—
imported	lb.	.18½ @	—
Lime, Superfine	lb.	.02 @	.02½
Magnesia, calcined,			
light,	lb.	.24 @	—
extra light	lb.	.45 @	—
heavy	lb.	.05 @	.05½
Orange Mineral	lb.	.13½ @	.14¾

COLORS

Blacks

Carbon Black	lb.	.16 @	.20
Micronex	lb.	.17 @	24
Lamp Black	lb.	.12 @	.40
Bone "	lb.	.05½ @	.07½
Drop "	lb.	.07½ @	.16
Ivory "	lb.	.15 @	.45

Blues

Prussian	lb.	.55 @	.60
Ultramarine	lb.	.10 @	.30
Cobalt	lb.	.21 @	.26

Browns

Iron oxide	lb.	.05 @	.06
Sienna, Italian,	lb.	.05½ @	.08
Umber, Turkey,	lb.	.04 @	.06
Vandyke, domestic	lb.	.03½ @	.04½

Greens

Chrome, light	lb.	.30 @	.32
medium	lb.	.35 @	.36
dark	lb.	.36 @	.45
commercial	lb.	.12 @	—

Reds

Antimony, crimson	lb.	.40 @	—
golden	lb.	.19 @	.25
red sulphuret	lb.	.20 @	.22
Indian, English, pure	lb.	.13 @	.15
Para toner	cwt.	1.00 @	1.10
Toluidine toner	lb.	2.10 @	—
Venetian red	lb.	.03½ @	.06
Vermillion, quicksilver,			
English	lb.	1.30 @	—
domestic	lb.	.25 @	.30

Whites

Albalith	lb.	.06½ @	.07
Aluminum bronze	lb.	.55 @	.60
Azolith	lb.	.06½ @	.07
Lithopone, domestic (factory)	lb.	.06½ @	.07
Zinc Oxide—American Process			
American Horse Head Special	lb.	.08 @	.08½
XX red	lb.	.07½ @	.08
American Azo:			
ZZZ (lead free)	lb.	.07½ @	.08
ZZ (under 5 per cent leaded)	lb.	.06¾ @	.07¼
Z (8-10 per cent leaded)	lb.	.06½ @	.06¾
Zinc Oxide—French Process			
White seal	lb.	.11½ @	.11¾
Green seal	lb.	.10¼ @	.10¾
Red seal	lb.	.09¼ @	.09¾

Yellows

Chrome, light	lb.	.17 @	—
dark and medium	lb.	.17 @	—
Cadmium Sulphide	lb.	1.50 @	1.75
Ocher, French	lb.	.03¼ @	.04
domestic	lb.	.03 @	.03¼

COMPOUNDING INGREDIENTS

Aluminum flake	ton	15.00 @	30.00
hydrate	lb.	.18 @	.20
Ammonia carbonate,	lb.	.10¼ @	.12½
Barium carbonate	ton	71.00 @	76.00
Barium Dust	lb.	.05 @	—
Barytes, southern off-color,	ton	15.00 @	20.00
Western, prime white,	ton	26.00 @	—
Basofor	lb.	.04¾ @	—
Blanc fixe, dry, f.o.b. works	lb.	.04¼ @	.04½
Carrara filler	lb.	.02 @	—
Chalk, precipitated,			
extra light	lb.	.03½ @	.04¼
heavy	lb.	.02½ @	.03¼
Clay, China, domestic,	ton	15.00 @	16.50
imported	ton	16.25 @	23.25
Dixie	ton	22.00 @	32.00
Blue Ridge	ton	20.00 @	30.00
Fossil flour	ton	60.00 @	—
Glues, extra white	lb.	.30 @	.40
medium white	lb.	.20 @	.26
cabinet	lb.	.18 @	.30
cabinet low grade	lb.	.15 @	.18
common bone	lb.	.08½ @	.14
Graphite flake, bbls.	lb.	.06½ @	.12
amorphous	lb.	.06 @	.12
Infusorial earth, powdered	ton	60.00 @	—
bolted	ton	65.00 @	—
Liquid latex	gal.	1.30 @	—
Mica, powdered	lb.	.15 @	—
Rotton Stone (powdered)	lb.	.02½ @	.04½
Silica (gold bond)	ton	31.00 @	—
Soapstone, powdered	ton	12.00 @	15.00
Starch, powdered	cwt.	2.80 @	2.90
Talc, domestic	ton	15.00 @	18.00
French	ton	25.00 @	32.50
French, high grade	ton	43.00 @	48.00
Italian	ton	47.00 @	58.00
Terra Alba	cwt.	1.85 @	2.00
Tripoli, white	lb.	.02 @	.02½
Whiting, commercial	cwt.	1.00 @	1.10
Quaker	ton	13.00 @	15.00
English cliffstone	cwt.	1.60 @	1.75
gilder's bolted	cwt.	1.10 @	1.25
Paris white American	cwt.	1.25 @	1.35
Wood pulp XXX	ton	35.00 @	—
" " X	ton	25.00 @	—
Zinc Oxide—			
5 per cent leaded		.06¾ @	.07¼
10 per cent lead sulphate	lb.	.06½ @	.07
20 per cent lead sulphate	lb.	.06½ @	.07
35 per cent lead sulphate	lb.	.06½ @	.07

(Also see whites)

MINERAL RUBBER

Gilsonite	ton	65.00 @	—
Genasco (factory)	ton	60.00 @	—
Hard hydrocarbon	ton	33.00 @	42.00
Soft hydrocarbon	ton	32.50 @	38.00
Pioneer M.R.	ton	42.00 @	44.00
320/340 M. P. hydrocarbon (c. l. factory)	ton	40.00 @	50.00
300/310 M. P. hydrocarbon (c. l. factory)	ton	35.00 @	45.00
Synpro, granulated, M. R. (factory)	ton	55.00 @	72.00

SOFTENERS

Acids

Acetic, 28 per cent	cwt.	3.17 @	3.92
Cresylic, 97 p. c.	gal.	.85 @	.90
95 p. c.	lb.	.55 @	.57
Muriatic, 20 degrees	cwt.	1.00 @	1.10
Nitric, 36 degrees	cwt.	4.50 @	5.00
Sulphuric, 66 degrees	ton	14.00 @	16.00
60 degrees	ton	9.00 @	13.00
Tartaric, crystals	lb.	.32 @	—

Alkalies

Caustic soda, 76 p.c.	cwt.	3.45 @	3.75
Soda ash, 58 p.c.	cwt.	1.95 @	2.30

Oils

Castor, No. 3, bbls.	lb.	.12½ @	—
Corn, crude, bbls.	lb.	.11 @	.11¼
refined		.11½ @	—
Chinawood, bbls.	lb.	.14¾ @	.15
Cottonseed,		.11½ @	.12
Glycerine, drums	lb.	.18½ @	.19
Linseed, domestic	gal.	.87 @	.90
imported	gal.	.86 @	—
Palm Niger		.07½ @	—
Lagos	lb.	.08 @	—
Peanut, domestic, crude	lb.	.15 @	—
Pine, steam distilled	gal.	.80 @	.85
Rapeseed, refined	gal.	.85 @	.86
blown	gal.	.95 @	1.00
Rosin, first rectified	gal.	.45 @	—
second rectified	gal.	.47 @	—
Tar, commercial	gal.	.31½ @	—
Soya Bean		.11 @	.11¼
Petrolatum, standard	lb.	.05 @	.08
dark amber	lb.	.03⅝ @	.03⅞

Resins and Pitches

Cumar resin, hard	lb.	.09 @	.10
soft	lb.	.09 @	.10
Tar Retort	bbl.	12.00 @	—
kiln burned	bbl.	12.50 @	—
Pitch, Burgundy	lb.	.05 @	—
coal tar	lb.	.01½ @	—
pine tar	lb.	.03 @	—
Rosin, grade K	bbl.	6.30 @	—
Shellac, fine orange	lb.	.90 @	—

Solvents

Acetone, drums	lb.	.21 @	—
Alcohol, denatured,			
No. 1 bbls.	gal.	.43 @	.45
Benzol, 90 per cent	gal.	.27 @	.32
pure	gal.	.30 @	.35
Carbon bisulphide,	lb.	.06½ @	.07½
Tetrachloride	lb.	.10 @	.10½
Dimethylaniline	lb.	.39 @	.43
Motor gasoline,			
steel bbls.	gal.	.22 @	—
Naptha, V. M. & P.	gal.	.21 @	—
Toluol, pure	gal.	.30 @	.35
Turpentine, spirits	gal.	1.55 @	—
wood	gal.	1.48 @	—

Waxes

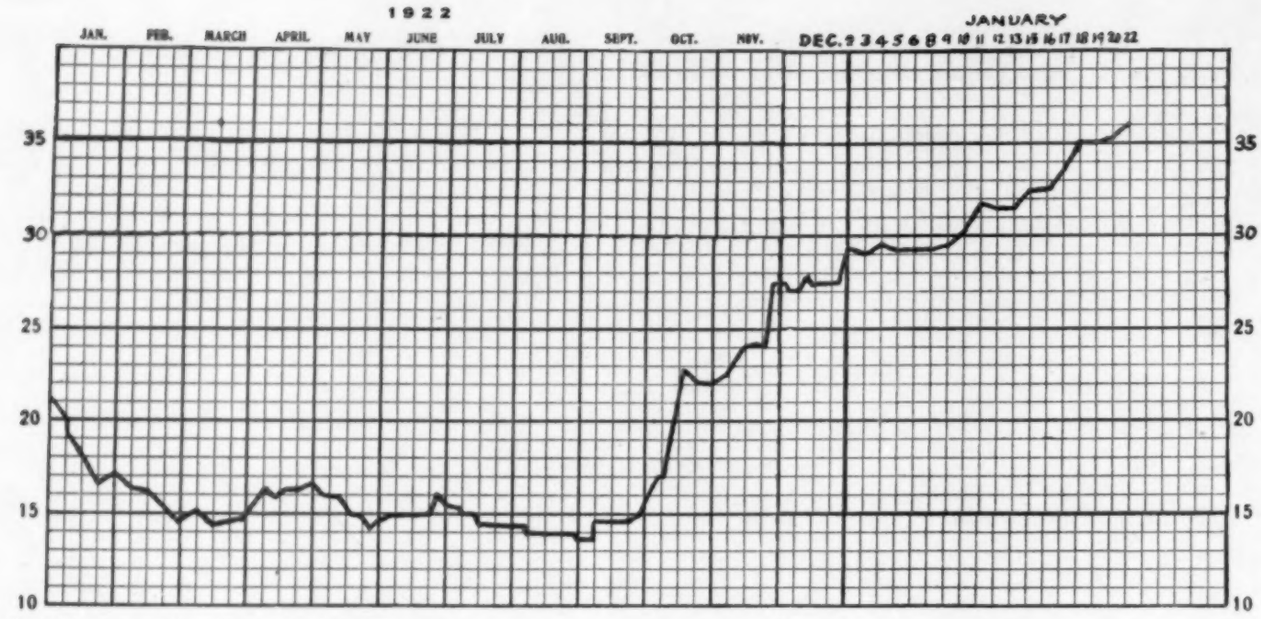
Beeswax	lb.	.45 @	—
Carnauba, No. 1	lb.	.20 @	—
Ceresin, white	lb.	.12 @	—
Bayberry	lb.	.20 @	.24
Montan, crude	lb.	.03½ @	.04
Ozokerite, black	lb.	.18 @	—
green	lb.	.26 @	.28
Paraffine	lb.	.02¾ @	.05
Sweet wax	lb.	.10 @	.12

SUBSTITUTES

Black	lb.	.08 @	.13
White	lb.	.09 @	.16
Brown	lb.	.09 @	.15
Brown factice	lb.	.09 @	.15
White factice	lb.	.08½ @	.15

VULCANIZING INGREDIENTS

Black hyposulphite	lb.	.25 @	.30
Sulphur chloride (jugs)	lb.	.13½ @	.15
" " (drums)	lb.	.08 @	.10
Sulphur flour (bbls.)	cwt.	2.60 @	—
(bags)	cwt.	2.35 @	—
100 per cent pure (superfine)	cwt.	2.60 @	—
Sulphur, 100 per cent pure,	cwt.	2.30 @	2.65
Bergenport brand (bags) (bbls.)	cwt.	2.55 @	2.90



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PRICE VARIATIONS OF RIBBED SMOKED SHEETS AT NEW YORK

Caustic Soda—Demand has been well maintained and the market displays a strong undertone. There has been some talk of advancing prices but at the close of this period leading producers had not changed quotations.

Soda Ash—There has been an excellent demand and producers are well sold ahead. No change in quotations were reported and light ash in barrels was offered at $1.95 to $2.30 per 100 pounds.

Aniline Oil—Demand was along limited lines but the market continued firm as the result of the advanced cost of raw material. Carlots can be had at 16 cents per pound and drums range from 16½ to 17 cents.

Dimethylaniline—Prices held strong with trading along routine lines. Carlots can be had at 39 cents per pound and 41 to 43 cents is the range for drums.

Lithopone—The advance in the price of crude barytes and the price of zinc caused practically all of the leading makers of lithopone to advance prices one-half a cent a pound. The change in price was expected and has not slowed up the demand; particularly for the higher grades.

Litharge—The market was active and firm at advanced prices. Casks are quoted at 10.15 cents a pound; 100 to 500 pound kegs, 13¾ cents; up to 2,000 pounds, 12.37 cents; up to 10,000 pounds, 11.68 cents.

Zinc Oxide—Although many large consumers had covered their requirements for months ahead before the advance in prices was made on all grades of this material the demand during the two weeks period was good.

Barytes—Prices remain the same at $26 a ton for prime Western, f.o.b., point of production and for Southern off color, $15 to $20 a ton, according to grade. The market was quiet.

Crude Rubber

NEW YORK, January 20, 1923

AT this writing first latex and ribbed smoked sheet, spot, have passed 35 cents, the asking price today being 35⅜. This figure represents an advance far greater than was anticipated when the British restriction plan went into effect on Nov. 1 last, and is about 22 cents above the low price reached last summer and early fall. The Stevenson plan contemplated stabilizing the market price at around 15d. or 30 cents, so that today's market quotation seems to indicate a run-away "bull" market. It is reported that practically all crude rubber dealers are "long" of the market.

Quotations of this date are practically as follows:

Plantations			
Ribbed Smoked Sheets	.35⅜	@	—
First Latex, spot	.35⅜	@	—
January/March	.35¾	@	—
April, May, June	.36½	@	—
July/December	.37⅜	@	—
Amber Crepe No. 1, spot	.34¾	@	.35
Amber Crepe No. 2, spot	.34½	@	—
Amber Crepe No. 3, spot	.34¼	@	—
Light Clean Thin Brown Crepe	.34¼	@	—
Commercially Clean Thin Brown Crepe	.33¾	@	—
Specky Brown Crepe	.33½	@	—
Roll Brown Crepe, spot	.32	@	—
Paras			
Madeira Fine	.34	@	—
Acre Fine	.32	@	—
Up-river Fine	.33½	@	—
Up-river Medium	.31½	@	—
Up-river Caucho Ball (shipment)	.30	@	.30½
Up-river Coarse	.28	@	—
Islands Fine	.31¼	@	—
Islands Medium	.29¼	@	—
Islands Coarse	.20	@	—
Cameta	.20	@	—
Xingu Ball	.18¾	@	—
Tapajos Fine	.33½	@	—
Tapajos Medium	.32	@	—
Pontianac			
Prime Pressed	.15	@	—
Plantation	.07½	@	—
Bangermassin	.08	@	—
Siak Gutta Percha	.21½	@	—
Prime Macassar	3.00	@	—
Balata			
Surinam Sheets	.85	@	—
Columbia Block	.55	@	—
Venezuela Block	.79	@	—

Reclaimed Rubber

NEW YORK, January 20, 1923

The most active market the reclaimed market has known in many months is now prevailing, and all factories and dealers are "bullish" on the situation. There is a pronounced demand for all grades of reclaims from all sections of the country and from all classes of manufacturers. This is an indication of how the advance in crude rubber has affected the purchasing departments of the various companies.

Quotations of this date are about as follows:

Standard Reclaims			
Floating	.16	@	.16½
Friction	.17	@	.17½
Boots and Shoes	.11¼	@	.11½
Boots and Shoes (washed)	.14	@	.14¼
Mechanical	.09½	@	.10
Hose	.10	@	.11
Tires, truck	.09	@	.10
Tires, auto	.09½	@	.10
White	.13	@	.13½

Scrap Rubber

NEW YORK, January 20, 1923

This market continues firm, with dealers holding on to large stocks in view of the strong advances in the prices of crude rubber. At present it is a dealers' market, factory buyers holding off in anticipation of a reaction in prices or because they have sufficient scrap on hand for present needs.

Quotations of this date are as follows:

Auto tire peelings	.01¼	@	.01½
Standard White auto ....ton	25.00	@	—
Mixed auto .....ton	13.00	@	15.00
Bicycle tires	.00½	@	.00⅝
Clean solid truck tires	.01½	@	.01¾
Boots and shoes	.03⅝	@	.03⅞
Arctics, trimmed	.03	@	.03¼
Arctics, untrimmed	.02¼	@	.02½
Inner tubes, No. 1	.04½	@	.04¾
Inner tubes, compounded	.03¾	@	.03⅞
Inner tubes, red	.03⅝	@	.03¾
Battery jars, clean hard rubber	.01	@	.01¼
Rubber Hose	.00¼	@	.00⅜
Red packing	.01	@	.01¼
White druggist sundries	.01⅜	@	.02

New Incorporations

CALIFORNIA

California Tire & Rubber Co., to deal in tires. $500,000. Incorporators: L. Beach and L. N. Wheatton. Principal office, Torrance, California.

DELAWARE

Giese and Melvin Inc., to deal in rubber. $500,000. Principal office, Wilmington, Delaware.

Mellinger Tire & Rubber Co., to manufacture tires. $600,000. Principal office, Wilmington, Delaware.

ILLINOIS

Cottage Grove Tire Service, to buy and sell tires, tubes etc. $5,000. Incorporators: E. E. Miller, A. M. Keasey and A. Wadoz. Principal office, 7518 Cottage Grove avenue, Chicago, Illinois.

Tire & Service Co., to buy and sell tires, tubes etc. $25,000. M. W. Oertlin, president; E. B. Schultz, vice president; L. Macher, secretary; W. F. Kral, treasurer. Principal office, 547 East Court Street, Kankakee, Illinois.

KENTUCKY

Your Tire Co., to sell tires. $1,500. H. B. Mahan, president; E. C. Hoagland, treasurer; E. Woodward, secretary. Principal office, Louisville, Kentucky.

MAINE

Pine Tree State Rubber Heel Co., to manufacture rubber heels and molded goods. $200,000. F. W. Hodges, president and treasurer; T. D. Cowen, vice president; C. F. Getchell and F. R. Merritt. Principal office, Sabattus, Maine.

NEW YORK

The Troy Tire & Rubber Co. Incorporators: Frederick Whitehouse, Anna Whitehouse, John T. Dinwiddie and Catherine Dinwiddie. Attorney, William F. Darby. Principal office, Troy, New York.

William M. Henry Co., Inc., to manufacture tires, rubber goods, etc. $20,000. Incorporators: H. McInerney, 504 West 159 street, New York City; W. M. Henry and M. Henry, 8 West 72 street, New York City.

Ace Tire and Rubber Co., to manufacture tires. $500. Incorporators: T. F. McMahan, L. W. Eggersman, B. O. Daly—1400 Broadway, New York City.

NEW JERSEY

Pierce Roberts Rubber Co., to manufacture rubber goods. $100,000. Principal office, Heath and Brian avenues, Ewing township, Mercer county, New Jersey.

Ray Rubber Products Corporation, to manufacture and sell rubber products. $10,000. Incorporators: D. R. Smith, E. A. London and T. J. Ryan. Principal office, 54 Woolsey street, Irvington, New Jersey.

SOUTH CAROLINA

Blackburn Sales Co., to deal in tires and tubes. $10,000. R. H. Blackburn, president and treasurer; L. L. Blackburn, secretary. Principal office, Spartanburg, South Carolina.

OHIO

The Timesaver Co., to manufacture "Timesaver" self-vulcanizing patch. $50,000. C. H. Day president and L. G. Porteous, secretary and treasurer. Principal office, 1312 Ontario street, Cleveland, Ohio.

Elyria Rubber Co., to manufacture rubber goods. $50,000. Incorporators: C. A. Barth, R. B. Struthers, W. E. Shay and H. Kofsky. Principal office, Elyria, Ohio.

Duratex Manufacturing Co., to manufacture rubber products. $200,000. Incorporators: H. T. Gottfried, J. S. Silber, J. J. Nessey, E. I. Hoffle and J. G. Blackstock. Principal office, 1110 Hippodrome Building, Cleveland, Ohio.

Capital Increases

The Goodyear Rubber Company of Middleton, Connecticut, has increased its authorized capital stock from $50,000 to $300,000.

J. B. Kleinert Rubber Co. of New York, N. Y., to issue 90,000 shares of common stock; no par value.

Name Changes

The Double Fabric Tire Co., Auburn, New York, to Auburn Rubber Co.

Underwood-Kerr Rubber Co., to Underwood Tire & Rubber Co., Texas, $300,000 to $500,000.

Trade Marks Applied For

[The following are trade-mark applications pertinent to our field pending in the United States Patent Office which have been passed for publication and are in line for early registration unless opposition is filed promptly. For further information address National Trade-Marks Company, Barrister Building, Washington, D. C. or Bush Building, 130 West 42 Street, New York, trade-mark specialists. As an additional service feature to its readers this Journal gladly offers to them an advance search free of charge on any mark they may contemplate adopting or registering.]

TROUBLE INSURANCE—No. 162,360. A. J. Stephens Rubber Co., Kansas City, Mo. For packages for use in making emergency repairs to the fan drives of automobiles and to nonmetallic tires and tubes.

FASHIONMAID—No. 168,804. Samuel E. Rosenfield, Detroit, Mich. For leather and fabric shoes, overshoes, leather, felt and satin slippers; and hosiery.

THE GARROD SHOE — No. 168,763. The Garrod Shoe Co., Inc., N. Y. C. Shoes of leather, rubber, cloth, fabric.

GASMASK—No. 142,345. Henry L. Kaufman, Boston, Mass. For hospital sundries, rubber gloves, hot water bottles, etc.

FRESCO—No. 169,290. Abraham Freedman, doing business as Fresco Rubber Company, Troy, N. Y. For rubber heels for shoes.

DRYNAMIC—No. 170,540. Philadelphia Storage Battery Co., Phila., Pa. For storage batteries.

NUVALUE—No. 170,665. Leon A. Olmsted, doing business as United States Athletic Company, Chicago, Ill. For batteries.

WEAR IS THERE—No. 149,933. B. Rosenberg & Sons, Inc., New Orleans, La. For boots, shoes, slippers, of leather, fabric, etc.

YE OLDE BRICK—No. 158,237. Jordan Marsh Company, Boston, Mass. For misses' boys' and children's leather, rubber, etc. shoes.

BELL CORD—No. 164,784. Bell Tire Company, Incorporated, N. Y. C. For pneumatic automobile tires.

SHUR LOC—No. 160,582. Harry E. Conroy, doing business as Edco Manufacturing Co., Wilkes-Barre, Pa. For repair patches for pneumatic tubes.

THE "81" TIRE STORES—No. 163,831. The "81" Tire Stores, Birmingham, Ala. For tires and inner tubes of rubber.

American Rubber Patents

1,440,176 Eloi Ricard, Melle, France, assignor to Societe Ricard, Allente & Cie. Distilleries des Deux-Sevres a Melle (Deux-Sevres), France. Vulcanizing Rubber.

1,439,794 Louis A. Casgrain, Beverly, Mass., assignor to United States Shoe Machinery Corp., Paterson, N. J. Machine for Applying Foxing to Rubber Shoes.

1,441,603 Arnold L. Schavoir, Stamford, Conn. Method of And Apparatus For Making Hollow Rubber Articles.

61,791 Henry G. Schmidt, Norwalk, Conn., assignor to The Norwalk Tire & Rubber Co., Norwalk, Conn. Tire.

1,441,403 Leonard Y. Croft, Denver, Colo., assignor of one-eighth to Minnie L. King, Cliff, Colo. Sectional Resilient Automobile Tire and Means for Securing The Same.

1,441,767 William Erastus Williams, Chicago, Ill., assignor to The Firestone Tire and Rubber Co., Akron, Ohio. Machine For Making Automobile Tire-Casing Carcasses.

1,442,007 Herbert F. Sheldon, Boston, Mass., assignor of one-third to Charles M. Burroughs, Boston, Mass. Pneumatic Tire.

1,441,654 Albert L. Austin, Cleveland, Ohio. Resilient Noninflatable Tire.

61,787 Arthur A. Matthews, Brooklyn, N. Y., assignor to C. Kenyon Co., Inc., Brooklyn, N. Y. Tire Tread.

61,759 John B. Berardi, Bridgeport, Conn. Automobile Tire Tread.

1,441,965 James W. Cato, Anniston, Ala. Tire Tube.

1,441,514 John T. Lister, Cleveland, Ohio. Apparatus And Method for Forming Tires.

1,441,649 Edward Wright, Dayton, Ohio. Expansible Metallic Core for Curing Pneumatic Tires.

1,441,458 Marcus A. Shotwell, Chicago, Ill. Demountable Tread for Pneumatic Tires.

1,441,461 Otto Trampusch, Augsburg, Germany. Pneumatic Tube For The Tires of Vehicle Wheels.

1,441,262 William C. Bardo and John H. Bardo, Arkansas City, Kans. Removable Overtread For Pneumatic Tires.

Report of Inventory—Production—Domestic Shipments of Pneumatic Casings—Inner Tubes—Solid Tires

November, 1920 to November, 1922

"Production" and Shipment" figures cover the entire month for which each report is made. "Inventory" is reported as of the last day of each month.

"Inventory" includes tires and tubes constituting domestic stock in factory and in transit to, or at, warehouses, branches (if any), or in possession of dealers on consignment basis, and as a total represents all tires and tubes still owned by manufacturers as a domestic stock.

"Shipments" includes only stock forwarded to a *purchaser* and does not include stock forwarded to a warehouse, branch, or on a consignment basis, or abroad.

(Compiled by The Rubber Association of America, Inc.)

	PNEUMATIC CASINGS				INNER TUBES				SOLID TIRES			
MONTH	No. Mfrs. Reporting	Inventory	Production	Shipments	No. Mfrs. Reporting	Inventory	Production	Shipments	No. Mfrs. Reporting	Inventory	Production	Shipments
November, 1920	36	5,880,016	649,742	806,023	40	6,131,935	742,815	920,938	11	298,875	21,355	34,217
December, 1920	43	5,508,280	506,111	1,327,153	43	5,786,929	508,446	1,481,285	12	303,473	16,297	40,828
January, 1921	45	5,319,605	703,450	965,417	47	5,586,163	740,824	1,042,617	12	303,753	21,220	29,116
February, 1921	45	5,193,018	819,892	1,073,756	46	5,415,464	916,627	1,129,881	12	304,374	23,365	29,599
March, 1921	46	4,597,103	1,163,314	1,614,651	48	5,044,861	1,346,483	1,643,690	12	283,800	28,710	43,926
April, 1921	49	4,527,445	1,651,418	1,785,951	51	4,916,772	1,762,122	1,983,571	12	269,985	28,859	42,080
May, 1921	59	4,451,668	2,100,917	2,085,882	57	4,751,880	2,210,040	2,342,567	12	264,663	35,156	40,122
June, 1921	63	4,154,456	2,313,265	2,643,850	60	3,835,098	2,359,928	3,232,673	11	240,336	28,395	49,867
July 1921	63	3,892,037	2,570,524	2,757,581	61	3,122,815	3,020,981	3,603,248	11	220,003	35,123	55,678
August, 1921	66	3,934,853	3,043,187	2,894,442	64	3,649,319	4,430,152	3,804,060	11	216,367	55,694	66,866
September, 1921	63	3,340,798	1,929,268	2,047,929	62	3,827,830	3,274,822	2,645,758	11	161,832	37,441	50,276
October, 1921	64	3,545,030	1,928,271	1,675,169	64	4,732,016	2,843,918	2,016,371	10	163,299	46,274	45,911
November, 1921	64	3,908,342	1,756,555	1,342,519	63	5,203,568	2,126,211	1,540,299	10	173,451	43,537	34,556
December, 1921	64	3,696,519	1,839,738	1,980,264	64	4,731,021	2,070,098	2,532,710	10	168,515	40,478	39,520
January, 1922	66	4,174,216	2,055,134	1,596,806	66	5,246,647	2,343,393	1,689,724	11	181,769	40,224	33,294
February, 1922	66	4,691,329	2,084,308	1,562,365	65	6,141,956	2,596,774	1,702,583	11	183,448	39,492	36,805
March, 1922	63	5,183,286	2,645,790	2,073,963	63	6,991,118	3,017,511	2,090,737	11	182,197	49,433	48,350
April, 1922	65	5,464,336	2,401,187	2,086,651	65	7,230,096	2,650,573	2,329,343	11	173,748	46,664	52,309
May, 1922	65	5,523,095	2,721,503	2,639,273	65	7,189,552	2,970,696	2,938,947	11	170,904	57,640	60,711
June, 1922	64	5,042,147	2,838,890	3,133,260	64	6,186,534	3,130,629	3,973,679	11	169,808	66,089	63,408
July, 1922	63	4,834,106	2,476,636	2,695,095	63	5,675,839	3,068,199	3,630,744	11	176,375	71,505	60,425
August, 1922	63	4,629,392	2,905,209	3,029,823	63	5,207,228	3,808,224	4,220,055	11	189,698	84,313	69,435
September, 1922	64	4,612,037	2,504,744	2,502,106	64	5,164,757	3,501,442	3,558,971	11	200,016	82,767	66,797
October, 1922	64	4,682,958	2,674,662	2,588,770	64	5,488,033	3,787,758	3,420,680	11	213,942	85,480	71,275
November, 1922	62	4,964,976	2,733,134	2,379,708	61	6,210,053	3,850,908	3,075,023	11	234,684	85,775	61,466

THE RUBBER AGE BUYERS GUIDE

ACCELERATORS
Daigger, A., & Co., Chicago, Ill.
Harshaw, Fuller & Goodwin Co., The, Cleveland, O.
National Aniline & Chemical Co., Inc., New York.
Rubber Service Laboratories Co., The, Akron, O.
States Metals Co., Inc., New York.
Wishnick-Tumpeer Chemical Co., Chicago.

ACCUMULATORS
Adamson Machine Co Akron, O.
Akron Rubber Mold & Machine Co., Akron, O.
Allen Machine Co., Erie, Pa.
Birmingham Iron Foundry, Derby, Conn.
Wellman - Seaver - Morgan Co., Cleveland, Ohio.

ACIDS
Daigger, A., & Co., Chicago, Ill.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
National Aniline & Chemical Co., Inc., New York.
Wishnick-Tumpeer Chemical Co., Chicago.

ACID TANKS
Birmingham Iron Foundry, Derby, Conn.
Devine, J. P., Co., Buffalo, N. Y.
Farrel Foundry & Machine Co., Ansonia, Conn.

AIR & STEAM METAL BAGS
Allsteel Ridewell Tire & Rubber Co., Dayton, Ohio.

AIR BRAKE HOSE
United States Rubber Co., New York.

AIR GOODS
Davol Rubber Co., Providence, R. I.
Hodgman Rubber Co., Tuckahoe, N. Y.
United States Rubber Co., New York.

AIR MATTRESSES
Davol Rubber Co., Providence, R. I.
Hodgman Rubber Co., Tuckahoe, N. Y.
United States Rubber Co., New York.

AIRPLANE AND BALLOON CLOTHS
United States Rubber Co., New York.
Hodgman Rubber Co., Tuckahoe, N. Y.

ALBA WHITING
Daigger, A., & Co., Chicago, Ill.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Industrial Chemical Co., New York.
Wishnick-Tumpeer Chemical Co., Chicago.

ALCOHOL
Daigger, A., & Co., Chicago, Ill.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Tyler Patterson Co., Clev'd, O.
Wishnick-Tumpeer Chemical Co., Chicago.

ALUMINUM FILLER
Daigger, A., & Co., Chicago, Ill.
Wishnick-Tumpeer Chemical Co., Chicago.

ALUMINUM FLAKE
Aluminum Flake Co., Akron, Ohio.
Butcher, L. H., Co., New York.
Fulper, Edward B., Trenton, N. J.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Rubber Service Laboratories Co., The, Akron, O.

AMMONIA AQUA
Daigger, A., & Co., Chicago, Ill.
Laidlow, Kelly & Co., New York.
Tyler Patterson Co., Clev'd, O.
Wishnick-Tumpeer Chemical Co., Chicago.

ANGLE THERMOMETERS
Taylor Instrument Companies, Rochester, N. Y.

ANILINE OIL
Butcher, L. H., Co., New York.
Daigger, A., & Co., Chicago, Ill.
Fulper, Edward B., Trenton, N. J.
Klipstein, A., & Co., New York.
National Aniline & Chemical Co., Inc., New York.
Tyler Patterson Co., Clev'd, O.
Wishnick-Tumpeer Chemical Co., Chicago.

ANILINE OIL PLANTS
Devine, J. P., Co., Buffalo, N. Y.

ANOLIDE
National Aniline & Chemical Co., Inc., New York.

ANTIMONY, SULPHURETS
Butcher, L. H., Co., New York.
Daigger, A., & Co., Chicago, Ill.
Fulper, Edward B., Trenton, N. J.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
States Metals Co., Inc., New York.
Rare Metal Products Co., Belleville, N. J.
Tyler Patterson Co., Clev'd, O.
Typke & King, Mitcham, England.
Wishnick-Tumpeer Chemical Co., Chicago.

APRONS—RUBBER
Hodgman Rubber Co., Tuckahoe, N. Y.
Miller Rubber Co., Akron, Ohio.

ARTIFICIAL RUBBER
Carter Bell Mfg. Co., New York.
Stamford Rubber Supply Co., Stamford, Conn.

ASBESTINE
Butcher, L. H., Co., New York.
Daigger, A., & Co., Chicago, Ill.
Fulper, Edward B., Trenton, N. J.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Tyler Patterson Co., Clev'd, O.
Wishnick-Tumpeer Chemical Co., Chicago.

ATOMIZERS
The Rubber Products Co., Barberton, Ohio.

AUTOCLAVES
Devine, J. P., Co., Buffalo, N. Y.

AUTOMOBILE COATS
Hodgman Rubber Co., Tuckahoe, N. Y.
United States Rubber Co., New York.

AUTO TOP FABRICS
Hodgman Rubber Co., Tuckahoe, N. Y.
Taylor, Armitage & Eagles, Inc., New York.
Turner Co., J. Spencer, New York.
United States Rubber Co., New York.

BALATA
Wood, Charles E., New York.

BALATA FILM (Colorless)
Peters Bros. Rubber Co., N. Y.

"A Guaranteed Rubber Latex"

F. R. HENDERSON & CO., INC.
MALATEX
New York City

The natural liquid product with a guaranteed minimum of 30% dry rubber. Preserved with ammonia, an effective and harmless anti-coagulant.